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Part I.—Original Articles.

THE ROLE OF THE MENTAL HOSPITAL IN THE NATIONAL HEALTH SERVICE.

THE PRESIDENTIAL ADDRESS DELIVERED AT THE ONE HUNDRED AND EIGHTH ANNUAL MEETING OF THE ASSOCIATION ON WEDNESDAY, 20 JULY, 1949.

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IT is your kindly custom to permit your new President to discourse freely and with more or less impunity on the subject of his choice, but in this very freedom I sense a whisper of restraint, for the domain of psychiatry has become so wide, if not indeed diffuse, that almost any theme might have been selected, from the riddle of the Collective Group Conscience to the question of Home Work for School Children. The time is long past when we could think of psychiatry in terms of psychoses and mental defect. The wide field of psychoneuroses and psychosomatic disorders, the frictional home, the disapproving suburb, the unemployable and the delinquent, and all the adverse social circumstances that complicate the problems of the aged and the very young, all these must be the intimate concern of the psychiatrist. It is therefore with some diffidence that I ask you to turn your thoughts to some desultory reflections on one particular aspect of our specialty which to some of us appears to be of primary importance, although to others it may seem like the resurrection of the outworn theories of that bygone generation to which I belong. I refer to the role of the mental hospital in the National Health Service.

Dr. Julian Huxley has said : " Without adequate comprehension right action is impossible ; and without an adequate picture, comprehension is impossible." I feel that this has been our difficulty. We have not succeeded in presenting an adequate picture, and consequently the people, the Press and the politicians have found it impossible to comprehend.

How shall we present an honest picture of the mental hospital ? We know that thousands of intelligent people come as patients to the mental hospitals in acute emotional distress, and after a few weeks return home with grateful hearts, cured as by a miracle ; on the other hand, we know that many acquire a state of prolonged intellectual isolation that renders them unfit for return to the active life of the community ; that others with bitter memories find haven in the mental hospital and desire not to return ; that many in the twilight of their lives lose grip of their affairs, and in confusion and amnesia need the shelter and the care that so far only the mental hospital has provided.

How can this conglomerate assembly be described to those who have not seen it ? And is it the best thing that we should continue to provide for so widely varying types in one comprehensive hospital ? For many years this Association has been trying to tell the public that the mental hospital is not what they imagine it to be. Occasionally we have been arrogant, sometimes querulous, more often suppliant, but always incomprehensible ; for we are the slaves of catchwords and formulae that beg the questions they are meant to answer, and their varied interpretations produce different meanings and fresh controversies. Such words are "Hospitalization," "Integration," "Preventive psychiatry," "Psychiatric unit," "Early treatment." All these words mean much to each of us individually, but do they mean precisely the same to all of us collectively ? And what exactly do we mean by a mental hospital ? Is it to be a backwater of the hospital services, or is it to be part of the main stream ? Is it to be for the treatment of all psychological disorders, or only for cases associated with anti-social behaviour ?

You may, I think, remember that some blind men once went to view an elephant. With outstretched hands one touched the side of the massive body ; quoth he : "I think the elephant is very like a wall." Another put his arms round a leg and said, "To me it seems a tree." But he who grasped the trunk declared, "It's not unlike a snake," while he who held the tail was sure "'Twas just a bit of rope."

I sometimes think the mental hospital is rather like that elephant. Special features and isolated parts of it are described in a form of words that may be not untrue, and yet the total meaning conveyed is something entirely different. We tend to generalize from an intimate knowledge of very few hospitals, not really knowing how good or how faulty the others may be.

For many years we have consistently advocated the integration of psychiatry and general medicine into one comprehensive medical service, and this would now seem to be accomplished. Psychiatry takes its place as one of the hospital and specialist services, financed and controlled by the same Boards and Committees that govern the other medical services. The new hospital authorities have welcomed the advent of psychiatry into the family circle of general medicine. There are times when many of them are a little bewildered by some of our peculiar habits, and certain aspects of the clinician's work remain a mystery even to our medical colleagues. With a background experience of voluntary and municipal hospitals they are disposed to interpret some of our recommendations in a way that we did not intend. Integration is sometimes taken to mean absorption, and hospitalization is thought to imply that the best mental hospital is the nearest imitation of a general hospital. I am sure we have never meant to suggest that a comparatively small general hospital could annex a mental hospital under its usual administration. Yet it has been to some a genuine surprise when this well-meant gesture has not been received with complete satisfaction; and perhaps we ourselves have been largely responsible, for even within our own group, ambiguous and misleading statements have been made when we have described our elephant in terms of the clinic and the early case. Prompted by sentiment, we have preferred, when possible, to treat our patients at the general hospital; and we have not always defined as clearly as we might the limitations of the general hospital in relation to psychiatry.

Whereas the extra-mural services were at one time most sadly neglected, and we quite rightly used every endeavour to increase out-patient clinics, psychiatric units, early treatment and neuroses centres, there is a possibility that the pendulum may swing too far, and that these facilities may be sold to Regional Boards as all-sufficient in a scheme of preventive psychiatry. It has indeed been said that if we cure the early case there may be no need to provide for long-term cases in the future. You know that nearly all your old patients were cured in their early stages, some of them several times. Some of us would even be willing to confess that a few of our own cures have subsequently consulted another psychiatrist, and I think you will agree that it would be unfortunate if in our efforts to promote the extra-mural psychiatric units we seemed to imply that the demands of the larger hospitals could thereby be deferred, or that treatment therein could be entrusted to a lower grade of specialist.

Through all the years that we have quite rightly preached the gospel of integration, we have to some extent misled our listeners by appearing to place too much emphasis on the alleged plight of the early case. It may be that the early case could be treated very well in mental hospitals if the general medical services had provided more adequate accommodation for the chronic sick and the aged.

Rightly, I think, we have refused to believe that public assistance institutions could deal with amnesic and confused old people, but we have always held that a large proportion of the aged patients in mental hospitals could properly be treated in other special hospitals provided they had adequate nursing staff, and the resulting relief of overcrowding would have made the mental hospitals more suitable for the early case.

One of my colleagues was not merely facetious, nor was he thinking only of psychiatry, when he said there was an urgent need for early treatment if we were to avoid the grave risk of spontaneous recovery. However, for other and better reasons, we are all agreed that early treatment is much to be encouraged, but it is absolutely essential that those who fail to respond should not be downcast by the suggestion that everything possible has been done, and that transfer to a mental hospital is the stamp of chronicity.

In 1851 Dr. Hill, of York, said: "Early treatment is often easy treatment." That was nearly 100 years ago, but in those old days Dr. Hill was referring to early treatment at the mental hospital. Now the same words are beginning to have a new meaning; they mean pre-mental hospital treatment. This also we welcome as something that we have advocated these thirty years, but when we see it featuring on the new plans as something to "save the patient from the mental hospital," we wonder whether we have all been thinking of quite the same part of the elephant.

Very far be it from me to detract or minimize the important growth of facilities for psychiatric treatment at general hospitals. Never was any development supported by a more complete unanimity, and indeed just therein lies the risk that the progressive young psychiatrist may be charmed away, for

> "Who will not change a raven for a dove?
> The will of man is by his reason sway'd,
> And reason says this is the worthier maid."*

Or is it the wealthier maid? I want to emphasize and to say quite categorically that the major clinical problem in the treatment of mental disorders is morbid apathy and indolence. The condition can be successfully treated, but only by most active and intensive measures. It cannot be done by giving mere lip service to occupational therapy, nor by providing rooms for the practice of handicrafts. The skilful occupational therapist will deal with her patients adequately and effectively, but she can only deal with those the doctor sends her, and she can practise her art successfully only when her patients have been skilfully pre-conditioned by the psychiatrist.

It is kindly to say, and comforting to hear, that the breakdown is due to overwork, but in truth the strain is always due to failure, and rest is not the remedy.

Without a skilfully organized programme of LIVING, zealously directed by experienced clinicians, patients will escape from failure into idleness, and when securely anchored in the harbour of the slothful environment, they will be, with shameless candour, classified as deteriorated.

What inducement can be offered to the young psychiatrist to retain his interest and to expend his energy on this difficult problem? I shudder to think how this class will increase if their treatment is ever thought to be simply a matter of administration.

It seems to me that the task of fitting psychiatry into a regional hospital service will not be quite satisfactory until a pattern of key hospitals and their relationship with associated extra-mural centres is clearly defined. Is it possible to conceive and create in every management area a base hospital that will embrace all aspects, and serve as the main centre of a group of treatment units for all types of psychiatric disorder? Can the mental hospital be that base? And if so, will its present form require to be modified? That is the vision that I want to submit to you, and I believe that it can be realized if the workers in this field strive individually and collectively to that goal. Among our members we have every shade of opinion on this question. We are not agreed upon the total function of the mental hospital, and some of us are content to say: "Our mental hospitals are the best in the world, but they are not quite suitable for the treatment of early cases; that public opinion is not yet educated enough to accept the mental hospital; that everything must be done, every effort must be made, every deception must be practised, to save the patient from the 'stigma' of the mental hospital."

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* "Midsummer Night's Dream."

Alas this stigma! What is it? It is an extraordinarily powerful influence and an evil influence, but is it possible that it may be unwittingly preserved by the elaborate care we take to avoid it? The perpetual flight of psychiatry from its own stigma has continued so long in circles that it is hard to say which is fleeing and which pursuing. We used to say that the stigma was attached to the process of certification, then to the mental hospital, and then to the word "mental," but I doubt if it is really attached to any of these. A stigma is a mark to be seen by gossiping neighbours, and these people can see a long, long way. How soon will they plant the stigma in the extra-mural centre and the psychiatric unit? Will psychiatry then become the undesirable tenant, coerced by the landlord to flit when the neighbours complain?

Other institutions have got rid of stigmas, but never by concealment. Always the stigma disappeared when the alleged shame became common and ordinary. I remember when a serious stigma was associated with lipstick, and like many of my age I have lived in a society where scabies and pediculosis were honourable afflictions.

Once upon a time in a certain genteel suburb of a famous university city it was not quite *comme il faut* to be treated at the Teaching Hospital, and in order to avoid the stigma, great sacrifices were made to pay the fees of less well equipped nursing homes. The neighbours talked when anyone was bold enough to defy this convention. It was not that the treatment was not good; it certainly was the very best, but John Smith tells us that the clinical examination by students lacked certain niceties which were thought to be essential:

"A curran o' callants wi' paper an' pens
Cam' in for their edification,
And the doctor sets ilk ane tae see if he kens
Whilken pairt o' my system's in maise perturbation.

"They surrounded my bed, an' they pu'ed aff the claes,
Then glowered at my haill conformation;
An' inspeckit me a' frae the head to the taes
Tae see I had nae malformation.

"Then I rose frae my bed, an' I said I was cured,
For I felt that a continuation
O' the scandalous treatment that I had endured
Wad ha'e brocht a man's days to a quick termination.

"The doctors, the medicine, the nursing, the meat,
I maun aye haud in high estimation;
But I'd rather forgae them an' dee on my feet,
Than submit to a clinical examination."

We know that the lingering dislike of the mental hospital is due to several factors, but is it possible that at least one of them may be a similar lack of delicacy, and that we may find that public opinion is more wisely discriminating in some things than we have supposed—those things of which Dr. Rees Thomas reminded us last year in his address on the patients' point of view?

We must try to avoid the temptation to explain away our shortcomings by thinking that the layman cannot understand. It may be that we have failed to notice that public opinion is ready now to accept the good mental hospital, even for the mild and early case, but quite rightly the people will want to be satisfied that the hospital really is good. How else can we explain the fact that while some hospitals enjoy a cordial and grateful fellowship with their patients' relatives and the residents of their neighbourhood, others have complaints from suspicious and querulous visitors ?

Hitherto people have been left to paint their own picture of the mental hospital from little bits of comedy, drama and tragedy, from stage, screen and fiction, where naturally the accentuated highlights so presented offer to popular imagination a spice and savour that must be lacking in the dull, grey story of actual clinical experience.

A certain film now showing invites them to imagine the worst, and it must be very disturbing to the relatives of patients to see this picture of oppressive tyranny and callousness. I should like, therefore, to say here that although during the past 35 years I have visited approximately one half of the mental hospitals in this country, and have lived and worked in five of them, I have never seen anything resembling some of the scenes depicted in "The Snake Pit." Of course, we are told that it isn't British, but the question will naturally arise, "Is there a British equivalent ?" Well, there is an equivalent description of British mental hospitals.

Twelve years ago a well-known journalist, Mr. Paul Winterton, undertook an investigation into that very question. He lived for a whole week in Clifton Hospital here in York, and was as free as any member of the staff to enter any and every ward by day or night. He spoke to patients and interviewed their visitors. He told them who he was and why he was there. He observed with his own eyes, and he invited complaints and criticisms. The results of his investigations were published first in the *News Chronicle*, and later in a book entitled *Mending Minds*.

He wrote :

> "I feel grateful for the opportunities which have been given to me belatedly to recognize and discard some of my own prejudices. Unquestionably the attitude of the Press towards mental illness and its treatment in mental hospitals has done much to perpetuate the prevalent public misconception on the subject. The responsibility for this state of affairs does not lie wholly at the door of Fleet Street, however. Newspapers are the purveyors of palatable information to an insatiable public, and though they sometimes print inaccurate and garbled news when they are unable to discover the truth, they do not normally prefer inaccuracy to truth. The fact is that on the subject of mental hospitals and mental treatment, most newspapers are uninformed. They are uninformed because so far no one has ever taken the trouble to interest them in the facts."

Well, Paul Winterton himself published the facts, critically but fairly ; yet one newspaper remained so uninformed as to print this bit of nonsense, which appeared in *Cavalcade* only a few months ago :

> "In the mental institutions to-day there are scores of eminently sane people slowly being driven mad. Hundreds of thug-like male nurses delight in inflicting torment on their helpless patients. Recently I heard of a case of a man under whose bed clockwork mice were put to frighten him. When he complained, he was told he was imagining things."

To us that seems too silly to refute, and I am sure it is not the voice of intelligent public opinion, but is there any hope of getting student nurses when such calumnious stuff is being published ?

You may be saying, as indeed it seems to me, that we have been hearing this these many years, and we have always thought it best to take no notice. We have pursued our ideals steadfastly and zealously through the 108 years of our Association's activities, and we are able to look back down the century upon progressive improvement. As I think of the good works that have been planned and the good intentions that have not been implemented, I cannot escape the thought that our tempo might have been quicker had we followed a more aggressive policy.

It is true that we have pursued our ideals, but we have never been able to catch up on them. We have always been working ten or twenty years behind our plans, and this has been aggravated by two standstill periods amounting to 16 years. None of us can look complacently on those little bedroom windows, with sloping sills 5 or 6 feet above floor level. They were condemned 50 years ago, but many of them still survive. None of us can be satisfied to see 200 patients loitering in an enclosed ward garden. None of us would say that it is fit and proper that any person should have to sleep night after night for years in a huge dormitory with 50 or more other people. Let us confess that there are such dormitories—not very many, perhaps, but why should there be one ? For these lingering blemishes we must accept some measure of responsibility, for we have been too grateful for small mercies when a modern admission block has been provided.

Sometimes, too, we have been timid in our adoption of new freedoms and hesitant to press for more. Not a few of us here to-day can remember the conferences and the advisory committees that preceded the Mental Treatment Act of 1930, and how, in fear of public criticism, we subsequently snipped and trimmed our early hopes. We suggested that an Order of Reception should not be required when a patient was indifferent ; the result was Section 5—a very different thing.

Survivors of the 1890 vintage told us then that we were but resurrecting many of their rejected plans ; e.g. we were told that the reception of voluntary patients into public mental hospitals had been originally intended in 1890, but that provision had been excluded—not under the influence of public opinion, but by the fears of medical superintendents. We were told that the obligation of the Justice personally to interview a patient before signing a Summary Reception Order was not primarily intended to safeguard the liberty of the subject—no such safeguard had been provided for the private patient—it was in order to insure that a poor person requiring treatment in hospital would not be sent to a workhouse. The observation wards took their rise at the same time from the fears of the Guardians and Relieving Officers, who thought that they might not be able to manage without the workhouse accommodation.

Thus the 3-day observation was not intended to save the patient from the mental hospital ; it was not intended to give the doctor three days to make up his mind ; it was intended to cover the occasional emergency when the means of removal to a mental hospital were not available ; but you all know how it became a routine procedure, and later the observation wards came to be sold as early treatment centres.

Now, after 60 years, Section 20 has been most ingeniously amended, and the simple stroke of a magic pen would appear to have provided for admission without certification. Unfortunately, Section 20 requires that either a constable or a duly authorized officer shall be satisfied that a period of observation is desirable; so that it is literally true that a consultant psychiatrist on a domiciliary visit must ask a policeman. Moreover, these officers are concerned primarily with Summary Reception Orders, which under the new Act are not strictly applicable to the ordinary patient with friends able and willing to make a Petition.

The general adoption of this expedient might therefore have the disadvantage of causing us to lose sight of the still more important amendments which have removed the need for intervention by public officials, between the general practitioner and the hospital.

Although I know this is a very unpopular view, I want to put it to you that certification *per se* is not the act that makes the stigma. Certification may soon be a rare occurrence, but the neighbours will still talk, and they do not discriminate between one section and another. They just think there is a process by which people are "put away," and that the duly authorized officer is the official who carries out the process. To my mind the great value of the new Section 20 is that it indicates that public opinion does not demand a Reception Order as a pre-requisite of admission, even in the case of an unco-operative patient, and that it is unreasonable to fear that public opinion would not be prepared to go further, and permit the transfer of responsibility from the constable to the doctor.

It is difficult to know exactly what public opinion is, but I think the reaction of the patient's family might be taken as a measure, and perhaps it is not so widely known as it ought to be that although the next of kin may discharge any certified patient, rarely does he do so against advice. The community fully realize that there could not be any conceivable reason for a public hospital to conspire deliberately with relatives to admit or detain a patient improperly. Naturally there is fear of careless mistakes by doctors, but in fact the ready-made Reception Order serves more to protect the doctor than the patient. It should therefore be applied for by the superintendent after admission in those cases in which he finds himself in need of a warrant.

Soon we may have another opportunity and a promise of fresh legislation. Never before have we had so enlightened a Ministry in the matter of mental illness, and the sky is bright. Let us therefore be bolder this time; let us assume that the House of Commons can be made aware that the mental hospital is the great defender of the interests of the mental invalid, and that it is therefore unnecessary to set up elaborate machinery to provide so-called safeguards against his admission.

How, then, shall we plan the mental hospital of the future? And how shall we present the adequate picture? If we follow the pattern of general medicine we shall have relatively small hospitals to provide curative treatment, and larger infirmaries for the care of long-stay cases, and by a process of screening at out-patient clinics and diagnostic units, patients will be selected for admission to the hospital appropriate to the nature of the case. In such a scheme there must always be a last resort to deal with the failures, and some of us are a little concerned lest this final resting-place might be called the mental hospital.

Strangely enough, this system is usually supported by the physicians at the reception hospital and condemned by those at the long-stay unit, for whereas all are agreed that we must think only of the patients' good, there is some doubt who among us shall have to think only of the good patients; for we do not all agree with Robert Louis Stevenson that "To ask to see some fruit of our endeavour, is but a transcendental way of serving for reward." Moreover, the modern trend is to evaluate both the physician and the hospital in terms of production, and according to the industrial potential of the patient; with that yard-stick psychiatry may sometimes seem to give short measure. It is therefore all the more important that we should guard against an uneven distribution of experienced clinicians which might divert them from the long-stay in-patients, many of whom continue for very long periods to be clinical problems demanding the greatest effort.

Can we say the same about the town parole group, the near-normals, the quiet, well-behaved, and industrious? Is it desirable that those patients be retained in the main hospital? I am convinced that for their care there is need for the establishment of sheltered villages and resettlement homes in every region, to prevent the continued occupation of hospital beds by this ever-increasing accumulation of passive settlers. Suitable accommodation might perhaps be found ready made in some of the sadly derelict mansions of this country, and at least a small proportion might properly be regarded as the responsibility of the Local Authority, rather than that of the hospital services.

At the present time we have all got in mind the need for special hospital accommodation for aged patients. We have all said repeatedly that some of these old people should not have to be sent to mental hospitals. We have not said that they were being sent illegally or improperly; we have meant that a more simple type of hospital with good nursing would be adequate and ought to be made available.

Whereas in the past only the mental hospitals had any kind of national co-ordination under a central authority, the new Health Service creates a corresponding organization for general medicine, and with it an obligation to provide accommodation for all forms of long-term illness, and there is therefore good reason to hope that we may now approach the problem of the aged as one common to both general and mental hospitals, for it is in this category that the unity of physical and mental health is most obvious.

While we cannot accept the view that the senile patient does not suffer from any psychiatric malady, we will agree that the mental hospital might well hand over its habitual practice of providing large senile infirmaries, and our Association will keenly co-operate in any effort to provide alternative care and comfort for the aged.

There is also the problem of the mentally defective, who occupy a very large number of mental hospital beds. I think we would all agree that many of them would be better in appropriate colonies, and possibly in the colonies there are some who might live and work in the sheltered village. What of the emotionally unstable defective? Methinks that I may find but scant support of this opinion; but that large class we know so well, of moods and tempers, sulks and rages, petty jealousies and childish quarrels, I think they too should be accommodated in mental deficiency institutions rather than in the mental hospitals.

How would these changes affect the picture? Briefly, this is my thesis:

A Hospital Management Committee would be responsible for the residents of a particular catchment area, and it would be their duty and their obligation to merit and to win the approval and the confidence of their public. Their aim would be to do so with the smallest number of patients in hospital per 100,000 of the area's population, for a mere increase in the number of beds provided is a very ironical boast

The mental hospital proper would not be an isolated institution, but an extensive group of widely dispersed units, of which the nuclear centre or headquarters hospital would deal with the reception, treatment, and, if necessary, the prolonged treatment of all types of acute and difficult cases, regardless of duration. It would supply the medical and nursing staff for all the subsidiary units and out-patient clinics. Suitable cases would be treated by the same specialists in the psychiatric departments of the general hospitals and at *ad hoc* neurosis centres, but these would not be used as screening centres for the main hospital. Remote from the headquarters hospital and situated in rural surroundings, relatively small resettlement homes would accommodate those who no longer required active treatment. Some of them would gradually become dispersed in the surrounding villages when the community learned the value of their labour, and knew that the hospital would be ready to deal immediately with any difficulty that might arise.

The main hospital would not be designed expressly for the convenience of the kitchen and the distribution of food, nor would expensive corridors be built to serve as mere umbrellas. It would consist of detached buildings set well apart and screened by trees; each block having its own segregated class and function, and vacancies would not be aggregated indiscriminately for the total hospital.

On this pattern, and with adequate geriatric units and mental deficiency colonies providing independently for their respective cases, the problem of overcrowding in our present mental hospitals would be solved; and here and there some ancient blocks could be demolished. Many hospitals require new reception units, and the main buildings of some are long overdue for replacement by modern structures, but I believe it to be possible, and I hope it may be the fact, that for many years to come the erection of a complete new mental hospital will be coincident with the demolition of an old one.

SOME REFLECTIONS ON THE NATURE OF AFFECTIVE DISORDERS, ARISING FROM THE RESULTS OF PREFRONTAL LEUCOTOMY.*

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FOR the use of the term " affective disorder " there is good literary warrant. Shakespeare, writing in the last decade of the sixteenth century, or just before it, uses the word thus :

" Necessity will make us all forsworn
  Three thousand times within this three years' space ;
For every man with his affects is born,
  Not by might mastered, but by special grace " (92).

This use is evidently taken from the Latin word " affectus," and is here used in the sense of " disposition." But Spenser, who, there is evidence to suggest, owed neither his use nor his coinage of this same word to Shakespeare, has given it a more specifically emotional connotation. In *Astrophel*, a collection of elegies on Sir Philip Sydney published in 1595, some of which are by Spenser and some by friends and imitators, there appear the words, attributed to Spenser himself :

" But thou (O blessed soule) doest haply not respect
These teares we shead, though full of loving pure affect " (94).

In Book VI of the *Faerie Queene*, published in 1599, the Lady Briana's emotional reactions are described when she learns that the lewd and wicked Crudor, to whom she is devoted, has been magnanimously spared by Sir Calidore, who has revoked his original intention to put Crudor to death :

" Whereof she now more glad than sorry earst,
All overcome with infinite affect
For his exceeding courtesie, that pearst
Her stubborn hart with inward deepe effect,
Before his feet herself she did project . . . " (95).

And Robert Greene, in his last play, " The Scottish Historie of James the Fourth," published in 1598, has borrowed the word :

" My gracious father, gouerne your affects " (46).

After the 1590's use of the word seems to have been abandoned until it was revived in the pursuit of psychiatry (101). Its lineage is thus respectable, its meaning is clear, its use is warranted by distinguished precedent, and in these respects it differs from many psychiatric terms. For our present purposes, however, it is somewhat too wide ; and it may be possible, by subdividing the affective disorders, to do something in the way of consolidating such knowledge as we have of the effects of prefrontal leucotomy on these conditions. It is to these considerations that we now turn.

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* Awarded a Special Prize by Dr. Charles Burlingame as Runner-up for the Burlingame Prize.

The occurrence of mania and melancholia in the same patient at different times had long been recognized before Kahlbaum formulated the two as different phases of the same disease process, under the term "cyclothymia." Kraepelin, in 1896, extended this concept, under the term "manic-depressive psychosis," which he regarded as a disease entity, with a course and an underlying pathology of its own.

There has been prolonged discussion of the matter since. Dana (21) preferred to recognize three groups of depressive illness: (*a*) involutional melancholia, a condition occurring in chronic worriers at the climacteric, together with pre-involutional conditions, akin to it in symptoms but occurring earlier in life, all characterized by agitation and worry; (*b*) simple recurrent melancholic states, which he said seemed "quite different," characterized by profound depression, apathy with loss of interest and psycho-motor sluggishness, which he considered apart from manic-depressive psychosis, though like it; and (*c*) simple recurrent melancholic states associated with intervening manic bouts, which he considered true manic-depressive psychosis.

Meyer (68) urged abandonment of the term "melancholia" in favour of the more noncommittal "depression," later to be amplified so as to denote the type of depression in the light of aetiology, symptom-complex and course of illness. Always in favour of concepts in terms of "more or less" rather then "either/or," he shifted the emphasis away from considerations of disease entities in themselves, and towards illness in terms of reaction and the interplay between the patient and his environment (67). His great influence and the good sense implicit in such a view have led to the persistence of this trend since.

But at once there arise questions which have never been fully answered. Allowing that all illnesses are coloured by the impact of the environment, and by the way in which the patient reacts, are there in fact affective disorders as disease entities *per se*? If so, can we separate these entities from illnesses merely reactive in type? If so, are the differences differences in kind or only of degree?

Schools of thought have developed as different answers to these questions have been framed. Although Kraepelin was driven to extend his original concept more and more inclusively, the German school, with its tendency to formalism and categorization, has been the main exponent of separation of "endogenous" and "reactive" conditions. Thus Muncie (76) says: ". . . the impression is gained that modern German psychiatric thought has not abandoned the disease entity, an impersonal something which attacks its victims, diagnosed by its pathognomonic signs, and places little value for diagnosis or treatment on attempts to reconstruct the story as a dynamic individual biography gone wrong. The disease process is either exogenic or endogenic in origin." And indeed, Bleuler (5), while admitting the occurrence of mixed psychotic pictures which transgress the bounds of formal categories says, "I follow, as far as possible, Kraepelin's classification, which is now pretty well understood in the whole world . . .," and goes on to say, "recently an attempt was made to place the classification of the psychoses on an entirely different basis by emphasizing the various factors participating in the causation, development, and course. I made the effort to initiate these viewpoints also here but had to desist from it." In France, the United States and in this country more elastic concepts have tended to prevail, but it is still customary, however fallacious, to speak and to think in terms of "endogenous" or "reactive" depression, and, raising the same problem in a different aspect, in terms of "psychosis" or "neurosis."

Thus, Mapother (65), in 1926, having declared that Kraepelin had "come to the conclusion that it is simplest to include all cases showing the affective excesses and also the syntonic types of intellectual and conative disorder" under the heading manic-depressive psychosis, startled his hearers into acrimonious indignation by refusing to admit any clinical distinction between a neurosis and a psychosis. "The distinction between neuroses and psychoses has grown out of practical difficulties particularly as regards certification and asylum treatment." He could "find no other basis for the distinction; neither insight, nor co-operation in treatment, nor susceptibility to psychotherapy will serve." As regards the notion that there were "neurotic" conditions which were purely psychogenic, and "psychotic" conditions dependent on structural change, he argued that "to assume that an enduring physical basis for habitually abnormal behaviour is probably non-existent because at present its exact nature is not demonstrable, seems to me a flat defiance of all relevant experience in medicine." His view, therefore, seemed to be that any "attack" of depression from whatever cause, whether seemingly reactive or seemingly endogenous, is mediated by essentially the same means. "The essence of an attack is the clinical fact that emotions for the time have lost enduring relation to current experience, and whatever their origin and intensity they have achieved a sort of autonomy." Much the same view has been expressed elsewhere by Symonds (98).

His hearers were able to tolerate this with varying degrees of equanimity. Buzzard (10) objected to a view which would not distinguish between manic-depressive psychosis and anxiety states. He regarded the recovery of the manic-depressive as more or less assured (if uncertain as to time) in the presence of adequate custodial care; but he thought that anxiety states, for recovery, needed and were susceptible to direct attack, the prognosis depending on the ease with which the anxiety could be disclosed and removed. The proper differentiation between psychoses and neuroses was prognostically and therapeutically important, as well as for academic accuracy. Ross (86), more indignantly, said that of a group of 66 patients diagnosed as manic-depressive, 12 had since been certified, whereas of 355 psychoneurotic patients admitted over the same period only 3 had since been certified, and two of those had been wrongly categorized against his better judgment; this alone made the distinction prognostically and therapeutically important. But further, between neurotic and psychotic depression there were differences in kind: remorse was not a feature of psycho-neurosis but was common in psychotic depression: the psychotic blamed himself, the neurotic blamed others. The pre-morbid personalities were different: for example, the manic-depressive often overworked, the neurotic said that he did, but did not: and there was a difference in reaction to environment in that the psycho-neurotic was capable of enormous improvement if reorientated, whereas psycho-therapy could achieve little with the manic-depressive.

Gillespie (41) between acid parentheses stressed the differences in heredity between manic-depressive and psycho-neurotically depressed patients, the differences in personality and body-build, that the accompanying physical disturbances differed in kind as well as in quantity, and that the psycho-neurotic varied topically according to stimuli, whereas the manic-depressive did not.

In 1930 there was a second debate, less of a foray, in which Buzzard, seemingly unpersuaded by Mapother, put forward certain criteria for distinguishing between psychotic and neurotic depression. He stressed the type of depression, its diffuseness colouring the whole outlook, though often centred on some event inadequate to justify it, its continuity, its independence of environment, its phasic morning-evening variation, its association with detachment from reality, loss of interest, loss of affection and of the power to grieve, with an apparent memory defect really due to inattentiveness leading to lack of concentration and indecision, and with a positive family history in which suicide and alcoholism were especially frequent. He contrasted this with neurotic conditions, in which responsibility for the trouble was thrown on to other people, in which the insomnia was more difficult to overcome, in which there was preoccupation with the heart and bowels as opposed to concern over the brain, in which the possibility of recovery was acknowledged and not rejected, in which distraction from morbid thoughts was easier, and in which the characteristic psychotic-depressive physical disturbances (dull eyes, lack-lustre hair, sallow and pigmented complexion, anorexia, constipation, furred tongue, failure of growth of the nails and lassitude) were absent (11).

Riddoch (84) stressed that the depressive attacks of the manic-depressive were often externally precipitated, and that the presenting complaint might be anything other than depression. But the depression was there, and specially characterized by its continuity, so that, although it might "lift" a little, it never disappeared except in convalescence. To the diagnostic criteria mentioned by others he added the possible occurrence of hallucinations and a special emphasis on the psycho-motor sluggishness (which Dana had also stressed).

Crichton Miller (17) considered the basic feature of the manic-depressive condition (which he preferred to call cyclothymia) to be a variability of affective response independent of external stimulus. Cyclothymic variation was an integrated one, in two contrasted forms (manic and depressive) and endogenously determined, comparable with the swinging of a pendulum; neurotic variation was a disintegrated one, depending on external stimuli and their associations, comparable with the motion of a boat with insufficient keel. Since no psychological theory explained cyclothymia and no psychological treatment influenced it, an explanation must be looked for outside psychological medicine. Its phasic nature suggested a physiological solution:

the similarity between the euphoria of alcoholic intoxication and the exaltation of the manic phase suggested a chemical action on the thalamus ; the similarity between the depressive phase and depressive states due to chronic intestinal absorption suggested an endogenous chemical factor ; the frequency of abnormal sex lives in cyclothymics, and the frequency of cyclothymic variation in relation to menstruation suggested a hormonal factor. Cyclothymia, unlike neurotic states, was a metabolic disease.

Boyle (6), thinking also in metabolic terms, urged that the frequency of thyroid disturbance in manic-depressive psychosis was beyond coincidence, and stressed the suggestiveness of what might be expected in the way of mood disturbance in hyper- and hypo-thyroidism, together with the similarity of age of incidence, and the higher incidence in women of both Graves' disease and manic-depressive psychosis.

Yellowlees (107) considered the difference between manic-depressive and neurotic depression essentially one of kind. He claimed that the cardinal feature of the neurasthenic was excessive fatigability, and that the neurotic was a person of active emotional reactions who bewailed the limitations imposed upon him by the illness, whereas the psychotic depressive was the reverse. Finally, somewhat strangely, he invoked the presence of insight in the neuroses and its absence in the psychoses as " a touchstone which he had never known to fail."

Reynell (83), on the other hand, claimed that manic-depressives might well have the fatigability of neurasthenics, and regarded the difference only as one of degree, with preponderant occurrence of mixed types.

Strauss (96) insisted on the inclusion of diagnostic criteria of physique and character (on Kretschmerian lines). He regarded it as " unthinkable " that a person of schizoid make-up could develop a typical attack of manic-depressive psychosis, and depression in such a subject should arouse suspicions of catatonic schizophrenia, or of a mixed psychosis with accordingly different prognosis. Viewed in this light, manic-depressive psychosis was a much rarer condition than was commonly supposed.

These views were, of course, clinical impressions. In the meantime Gillespie, stimulated no doubt by the debate of 1926, had sought facts in his own support. In his " Clinical Differentiation of Types of Depression " (42) he set out conclusions drawn from immediate scrutiny of case material. From 25 cases studied with detailed regard to the heredity, life history, precipitating factors, symptom-complex of the illness and its course, he formed three groups of depressive cases.

Group I (14 *cases*).

Distinguished by its affective variability, especially in response to ascertainable factors, whether these last were external to the patient or were topics of preoccupation. In addition to depression there might be anxiety, but the depression was " as a rule " the leading feature and indicated something more than, and not essential to, anxiety states. The chief topic of preoccupation was almost always the patient's health, and usually the depression (with or without anxiety) itself. The preoccupations led to impaired attention and concentration, but not to retardation. And there was usually a reduction of motor activity, though of a selective kind in which the patient's wishes could be discerned.

The depression in this group was causally related to conscious factors, though such relationship was not fully, if at all, understood by the patient. Thus, there was insight into the abnormal nature of the affect, but not into its cause.

Group II (7 *cases*).

A group of autonomous depressions in whom the (admittedly considerable) affective variation was spontaneous and independent of ascertainable intercurrent stimuli. Remorse and apprehension were frequently but not invariably added, but there was no tendency to blame the environment (which had been found in 7 out of 14 of Group I). As regards topics of preoccupation, self-accusatory trends were common (almost absent in Group I) and ideas of unworthiness more frequently expressed, but both were in fact found in each group. Complaints as to cerebration were more complex in this group and did not appear directly related to the topics of preoccupation, thus differing from Group I. This was in line with the " impression " that the autonomous illness was more extraneous and less closely identified with the patient's personality. The insight in this group was, therefore, to that extent better.

Physical signs and symptoms were not helpful in differentiation. Precipitating causes and suicides were found in both groups. But a family history of psychoses, specially depressive, was more common in the second group, and the general personality traits differed from the predominantly quiet, shy, sensitive, timid, worrying types of Group I.

Group III (4 *cases*).

This small group was distinguished chiefly by hypochondriacal preoccupation overshadowing (but co-existent with) the depression : by the lack of insight both into the affective disorder and the hypochondriasis : by the number of accompanying symptoms, and by the actual rejection of explanation and re-assurance. In personality they were much closer to Group I than to Group II, and the form of illness had an involutional stamp.

Cases of the first group were the only ones accessible to psychotherapy in any noteworthy degree, and they showed the shortest illnesses and the highest degree of recovery.

Gillespie concluded that no one sign could serve as a diagnostic, prognostic or therapeutic indication, but " of all the single criteria employed, it is probable that reactivity in the sense of this paper is the one of greatest practical value." The number of cases was surely far too small, but that he still felt confident of there being sufficient of a trend to allow of distinction between psychotic and neurotic depression is shown by a further paper. In this, a contribution intended to illumine an obscure subject for the comparatively uninitiated rather than for the expert clinician, he set down criteria for the differential diagnosis more or less in the light of what he had found from study of the 25 cases (43).

The next stage in the controversy was marked by the appearance of three papers by Lewis, which remain the most scholarly and authoritative productions on the subject in English. They annihilated that little hope of orderliness in a confusing subject which Gillespie had held out. The first (60) was a historical survey of melancholia setting the matter in due perspective. The second was a clinical survey of depressive states derived from a minutely detailed scrutiny of 61 cases. The third was a prognostic study on the same material (62). The outcome of this research must have been disconcerting to the separative school, for not only were the clinical impressions propounded by them in the debates of 1926 and 1930 not borne out by examination of actual case-material, but no separative criteria emerged at all. Lewis concluded that it was impossible to place the majority of cases in either group, and that "the term reactive depression and the grouping it denotes" would be better done away with. The prognostic study which followed was equally ideoclastic: no unequivocal prognostic signs emerged at all. A certain trend towards uniformity in the cases who died was spoiled by their being too few for statistical significance. In the other cases, while certain features seemed on the whole favourable or unfavourable, there was no constancy, so that cases with favourable outcome not infrequently showed unfavourable features, and vice versa. Nor did the remissions become shorter as time went on (as had been held by the German school), and though there was some trend towards lengthening of the attacks themselves, this was irregular. It had been implied in the debates that complete recovery was the rule, but complete recovery—even including those cases which had a second attack, again to be followed by complete recovery—occurred in only 18 of the 61 cases. And heredity had no special significance. Lewis, who describes himself as "chagrined" at the somewhat negative results of this laborious and painstaking enquiry, concluded, "Short cuts and clear sign-posts do not exist," and that manic-depressive psychosis is "a provisional group of heterogeneous disorders."

It remained for Curran, in a paper pregnant with sarcasm (18), to apply Gillespie's differential criteria. He found the criteria ambiguous and the application extremely difficult, but with the best attempt on a series of 25 depressive patients he found, not without gusto, an almost incredible variety of combinations of "neurotic" and "psychotic" features occurring in each case. No differentiation on such a basis could be made.

It seemed that the wheels of Juggernaut had passed over the separative school. But in 1940, Rogerson (a pupil of Gillespie and a successor to Ross, just as Lewis was a successor to Mapother, in whose school Curran also served) revived the argument (85). He reasserted the prognostic and therapeutic desirability of distinction between neurosis and psychosis, and maintained that it had clinical validity, quoting three illustrative cases. "The only method of arriving at the diagnosis is to study the history and day-to-day behaviour of the patient with minute care. It may then be possible to decide whether or not the mood change observed is dependent upon the preoccupations of the patient, themselves related in a proper manner on the one hand to external reality, and on the other to his instinctual strivings." This is the same as Gillespie's concept of reactivity. He quoted Ross (87) that out of 1,043 patients with a diagnosis of neurosis followed over three to fifteen years, less than 5 per cent. developed psychotic illness; that is to say, their pattern of reaction remained essentially the same, which, if the difference between neurosis and psychosis were merely one of degree, is not to be expected.

It will be noted that both Rogerson and Ross seem to have been quite confident not only that there is some essential difference between psychosis and neurosis, but that they could recognize this difference when they saw it. If there are no valid criteria of differentiation Ross's figures are meaningless.

Curran and Mallinson, in an analysis of 99 depressive states occurring in sailors in the second world war, were again unable to find any division between endogenous and reactive depressions. They did, however, find it possible to make some distinction between affective and hysterical disorders, although the latter involved affective components; and they regarded this distinction as of some therapeutic and prognostic importance (19).

Tredgold (100) found similarly with soldiers that the differences were of degree rather than kind, that some passed from what might be called psychotic depression to "neurotic" depression and vice versa, and that no sharp classification could be achieved.

Reviewing the matter at this point, one sees clearly what is the aim of the separative school, however impossible it may be of achievement. The standpoint taken by its opponents is not so clear. Mapother was certainly liable to the construction that all the affective disorders arose on an anatomical and physiological basis which in all instances was essentially the same. This view is rather difficult to accept.

Whitehorn, on the other hand, though not approving the separation in any clear-cut form of endogenous from reactive depressions, views the matter in terms of personality rather than in terms of anatomy, physiology and pathology. It is his view that a psychiatrist who decides whether a depressive condition can or cannot be legitimately considered due to a given set of circumstances is—in reaching such a decision—revealing more of himself than of the patient. He claims that the more is known of the patient the more are "reactive" features in the illness likely to be detected, and that patients who show manic and/or depressive reactions develop these through some special predisposition of the personality, which causes them to be "specially sensitive to praise and blame, to feel a strong obligation to control themselves, and to find in situations certain elements, not obtrusive to the outside observer but of special personal significance to themselves, which lead to excessive inhibitory reactions, and ruminations involving self-blame or features of inadequacy, self-justifying and self-assertive counter-currents, of which the manic or depressive reactions are the symptomatic expression." He says, however, that he finds "depressive reactions too diversified to fit a unitary formula. Quite different importance has to be given in different cases to obsessional trends, to fatigue, to boredom, to loss of supporting persons, loss of dependent persons, etc." (105).

The analytic school, also, would seem to regard all depressive states as reactive; and mainly to some form of loss, not merely in the material sense, but of something, whether a person, a cause or an idea, which had long been identified with the ego: and the loss of which love-object brings out the ambivalence felt towards it so that an attack is launched upon it, depreciatory and hostile: but that attack is turned inwards on the self, owing to the identification that has long existed between that love-object and the ego. Hence, self-depreciation, unworthiness and suicide.

Here, indeed, we are a long way from Kraepelin, who, seeking for causes in terms of altered metabolism, disturbances of vaso-motor innervation or diseases of vaso-motor pathways, or auto-intoxication, has said that such external influences as bereavements are " possibly sparks for the discharge of individual attacks, but that the real cause of the malady must be sought in permanent internal changes."

Where the opinions as to causes are so widely disparate as these, one cannot but be suspicious that the different observers are describing different things, and that, from a heterogeneous group, each has selected an aspect for description.

Curran, after showing the impossibility of differentiation between psychotic and neurotic depressions, remarks: " Because the types of reaction which are recognized at present are also recognized as neither being clearly cut, nor accurately and rigidly differentiated and defined, it does not follow that they cease to have any meaning or use." But later he says, " No sharp division appears to be achieved. It is argued that it does not in fact exist . . ." Elsewhere, however, he writes of " a classical manic-depressive psychosis and its opposite, an allegedly typical neurosis " (20), and " of the small classical manic-depressive group, which does combine a persistent abnormality of mood with an essentially endogenous origin." This, however continuous the series between one extreme and the other, necessarily implies some possibility of separation, and accords with the fact that of Lewis's 61 cases, there were 10 in which no environmental cause could be found, and 9 in which he was " almost satisfied " that the precipitating factors were an adequate cause for the illness: at any rate the situation had been an " indispensable efficient cause." These factors do not lead one to suppose that possibilities of differentiation are necessarily dead, which view is strengthened by other considerations.

First, the arguments on either side are based (apart from the clinical impressions which are so dangerous) on very small numbers of cases. It is quite possible that a survey on a wide scale (which might well be a life work) would show broad general trends in favour of the contentions of the separative school. This would constitute a contribution to knowledge, and although Lewis's work suggests that such broad trends would be quite unhelpful when it came to dealing practically with an individual case, that would not necessarily be so if some form of treatment were to be discovered, efficient in some affective conditions but not in others.

Second, one is struck by a certain uniformity (in a subject which lends itself to uniformity so little) in the concepts propounded by the discussants of 1930 of the depressive phase of manic-depressive psychosis as they saw it: and that they agree pretty well with Dana's description of a quarter of a century before. There is no doubt that such states occur. It would appear that, attractive through their relative simplicity, they were taken as a paradigm of depressive conditions, and were thus thought to occur more often than they really do. Perhaps they represent the depressive phase of manic-depressive psychosis in pure culture. But in the great majority of cases the illness is coloured by the reaction of the individual to it, as well, perhaps, as by the addition of genes of minor effect. Such a combination of added factors may alter the picture entirely, giving the appearance of a condition different in kind as well as in degree, though the fundamental mechanisms may be just the same.

This brings us to our third consideration, the genetic aspect. Here, indeed, lie possibilities that the appearance of a condition different in kind may not be fictitious, and that there is a difference in kind, in fact. How is it possible, if there is no differentiation between different types of depression, for Lewis to write in another place (59) of the genetics of manic-depressive psychosis, "The figures conform broadly to expectation if one assumes that there are three genes concerned, of which two are recessive and one dominant." If everyone who has a fit of the blues is to be considered liable later to develop an attack of mania, no such figures could ever have been compiled. Slater has observed (93), "In an investigation of manic-depressive insanity only the indisputable cases should be included as part of the working material," and enough such cases have been found for a probable estimate of the genetic basis of the condition. And a hint, at least, of further differential possibilities is evident when Slater remarks, "It is one of the services of psychiatric genetics to have shown that what is commonly called involutional melancholia has nearer connections with the schizophrenic psychoses than with the manic-depressives."

Finally, we come to considerations arising out of recent advances in treatment. It is noteworthy that the bulk of the papers we have been considering were written before there was any great experience of convulsive therapy. The latter has come to be directed more and more specifically towards affective states, and especially to states of depression. Cook, in reviewing the literature (15), says, "It may be said at once that no doubt exists as to the efficacy of convulsion treatment in affective psychoses." But he issues a warning that "the presence of anxiety in a depressive setting" is according to the general trend of opinion an unfavourable prognostic feature as regards application of this treatment, and says, "It is possible that much of the success reported in treating psycho-neurotics with convulsions consists in clearing up essentially depressive symptoms, which may often simulate neurotic anxiety." Sargant and Slater (91) say, "Some neurotic types of depression may be aggravated by very few convulsions," and "The only patients with "anxiety neuroses" who will benefit from convulsions are those who are wrongly so called, who are in fact suffering from a depressive illness in which anxiety and agitation are to the fore." Sands (90) states unequivocally that it is the "psychotic depressions" who gain with electroplexy. It is his opinion that the mood disturbance may not be the most important feature in the differentiation of these cases; more so are "the diminishing state of awareness with movement away from reality, increasing introspection with narrowed range of thought and repetitive preoccupation with a few ideas." (This concept is reminiscent of the French School of thought, as indicated by Lewis (61).) He goes on to say that some cases show agitation, but that this depends mainly on the conflicts, and unlike "neurotic tension," is not easily heightened by outside influences. He finds cases with neurotic depression "quite different" with their hypersensitiveness and awareness, and he notes, as did Gillespie, the lack of identification of the illness with the personality. He concludes by observing that the effect of this treatment shows that the problem of neurosis or psychosis is less academic than ever before, since the decision whether to employ a drastic treatment depends on the answer.

If such a distinction, in the light of response to electroplexy, is valid, and is of importance in deciding the suitability of a case for treatment, how much the more important must it be when considerations arise of a far more drastic treatment of irreversible kind?

It is desirable, therefore, to examine the effects of prefrontal leucotomy from a special aspect. The detailed results in a series of 300 cases all investigated and personally followed by the writer (at the suggestion of Dr. Thomas Tennent and under the aegis of St. Andrew's Hospital, Northampton) are in course of preparation. In this series there were 82 cases of affective disorder which survived the operation sufficiently long for study. It is these 82 cases that we are now going to consider, not so much as regards post-operative function or post-operative deficits, but as regards the degree of recovery achieved in relation to the type of disorder present, so far as we are able to determine it.

Of these 82 cases we may make the following classification:

(1) One patient had had recurrent attacks of mania, but without attacks of depression.

(2) 15 were essentially in the manic-depressive group in that they had shown evidence both of mania and of depression.

(3) 27 had had recurrent depressive illnesses but without manic attacks.

(4) 36 had had single depressive illnesses, and were operated on at one stage or another of the only attack to which they had been subject.

That leaves three other cases for consideration:

(5) One of these may be considered to have shown an essentially reactive depression in that his disturbance of mood was clearly related to, and caused by, intractable pain—by difficulties in the diagnosis and treatment of which he had become increasingly demoralized.

(6) The other two were fundamentally obsessional patients, whose mood disturbance was considered essentially based upon, and arising from, their obsessiveness.

We will consider these groups *seriatim*.

(1) The patient subject only to manic attacks continued to be manic after operation in that he still showed great push of talk with distractibility and

undue cheerfulness of mood. His spontaneity, excitement and activity were, however, reduced, so that the condition persisted in a modified form.

(2) Of the 15 manic-depressive cases, 8 showed the illness in classical form. One, operated on in a depressive phase characterized by agitated self-reproach with feelings of guilt, remained depressed in so far as he retained depressive delusions (which he had lost during previous remissions) with some fundamental lowering of the mood ; but he had lost his agitation, was able to tolerate his condition, and was quite well enough to be discharged from hospital.

One swung very slowly and almost from the moment of operation from a state of unvarying depression of 12 years' duration into a state of gradually increasing animation, which culminated in frank mania 18 months later.

One, operated on in a depressive phase, swung quickly into a state of hypomania which gradually settled to a vivacity within normal limits.

One, operated on in a depressive phase, returned to normal but relapsed 21 months after operation into a hypomanic state (in which co-existent depressive features were discernible), which rapidly subsided.

One, whose attacks (constantly recurring over a period of 14 years) had only twice demanded hospital care, and were over a period of 11 years compatible with earning his living, was improved to the extent that his mood remained equable over the ensuing 2 years.

Of the other three, in whom manic phases (in which they were operated on) had predominated, 2 were substantially unchanged, and the other has relapsed, though here again the post-operative state showed some modification in that the subsequent states were of milder form.

The other 7 manic-depressive cases showed atypical features, both in the content and behaviour, while otherwise conforming generally to a manic-depressive pattern. For example, incoherence and inappropriateness of replies, odd posturings, Messianic ideas, impulsive violence, etc., were noted at one time or another. Of these 7, 1 was noteworthy in that he had an almost unvarying cycle of depression and mania on alternate days (though that had not always been so), the rhythm of which was unchanged by operation. But in him, as in 2 other cases, the intensity of the disturbance has been modified. One case remained free from attacks for the abnormally long period of 10 months before dying from an obscure cause. The other 3 cases have remained well for periods much in excess of any remission that they had previously enjoyed.

Thus, out of these first 16 cases that we have considered, in the manic-depressive group or closely allied to it, the symptoms have either persisted or recurred in no fewer than 11, while of the 5 who "recovered," 1 survived only for 10 months after operation. Now, of these 16 cases there were only 7 in whom it was felt that psychological mechanisms played any serious contributory part in the development of the illness. It is striking that the 5 "recovered" patients are to be found among those 7 ; the 2 cases in the development of whose illness psychological mechanisms appeared to play a serious part, but who did not recover, were (*a*) an unstable epileptic dullard whose psychotic phases could be construed as a reaction to the frustration engendered by his handicaps, and whose handicaps remained unchanged by operation, and (*b*) a 52-year-old woman whose personal and family histories suggested a heavy constitutional loading, and who became markedly deteriorated in the course of a 3-year illness of such severity and turbulent course that any original psycho-dynamics had become lost in a psychotic deluge, so that the final phase bore no relation to anything that had gone before.

The length of time over which the various attacks had been distributed had no influence on the outcome, but all the recovered cases had had remissions of good quality (if brief) within two years of operation. None of the unrecovered cases had had such remissions. These figures suggest that the more the illness appears to be autonomous and constitutionally determined, the less effect does the operation have ; and the more the illness appears to be reactive, in the sense that psychic conflicts may precipitate, or prolong the attacks through influencing the mood, the better are the chances that operation affords.

(3) Of the 27 cases with recurrent depressions, 14 had had severe illnesses characterized by an unremitting chronicity. In 6 of these cases there were situational factors which might have helped to precipitate the condition. But it was impossible, on common sense grounds, to consider these as adequate causes either for the severity or duration of the illnesses that followed. These last appeared in those respects truly autonomous, though it is felt that the reactions shown by the patients towards the illnesses themselves may have prolonged the latter and militated against early recovery.

Of these 14, one entered a curious post-operative state (which we shall see paralleled in another case later), in which she giggled, was facetious to the point of fatuousness, made sharp sallies, played Puckish jokes and was thoroughly irresponsible. But when she could be got to discuss how she felt, she said that she was still depressed, that she wished she were dead, that she had no feelings or interest, but experienced—in parallel with her affective lack—a lethargy for life which was in fact evident in her behaviour. Her statement carried much conviction, and it is believed that the essential nucleus of the 12-year illness remained, although her attitude towards it had been altered. She has remained much the same for more than 2 years.

Another, markedly agitated and ill for 8 years, took 15 months to recover from his depression, although meanwhile his lamentations and expressions of hopelessness had been markedly reduced. Both these cases show what has also been observed by Mixter, Tillotson and Wies (72), and what has been referred to by them as "affective de-sensitization," i.e. a more tranquil attitude leading to better tolerance of the persistent symptoms. Another case, though able to live at home, was still depressed with affective loss at 6 months after operation, though by the end of a year she was fully well.

A fourth took 9 months to recover from his depression, though his agitation had been at once reduced after operation ; 2 years after operation, at the age of 60, he entered a state of hypomania, of which there had previously been no history.

A fifth, a chronic alcoholic, was recovered from his depression within 6 months, but entered another, though milder, depressive phase, complicated by alcohol, 2 years after operation.

A man of 81, who had been very severely depressed and suicidal, largely recovered but was post-operatively labile. The picture was complicated by senile changes.

The other 8 patients all recovered fully from their depressions, and have remained free from relapse for periods between 1 and 2½ years.

Thus, in these 14 cases, there was post-operative persistence of depression over considerable periods of time in 4 cases, with relapse into hypomania of one of those, and recurrence of depression in a fifth.

Now, of these 14 cases, 6 had been continuously ill for more than 2 years, and there were only 2 of those 6 cases who did not show this slow improvement. Of the 8 cases who had been ill for less than 2 years, none showed a slow recovery. There seems to be some relation, therefore, between the speed of recovery, on the one hand, and the severity and duration of the symptoms on the other. It might be thought that those cases who showed persistence of symptoms with slow improvement might have shown the latter anyway, even in absence of operation. Yet the balance of the evidence seems against this, since the attitude of the patients towards the illness was in all cases altered to a more favourable one. It may be that the restriction of interest to the symptoms, the agitation and self-absorption, all tend to prolong the attack, so that moderation of these helps to facilitate a spontaneous recovery.

Next, there were 4 patients who showed persistent depression with little variation, but marked by accompanying obsessional symptoms, and in two of them also by compulsive thoughts of violence, which were absent when the patient was well. In 3 cases there were some situational factors. All 4 showed a rapid and satisfactory recovery without relapse over a period of 2 years. All had been ill for less than 2 years.

Then there were 5 patients who had shown repeated attacks of depression between brief remissions of good quality extending over periods of 17, 15, 9, 6 and 4 years, the attacks lasting for a few months and the remissions for a few weeks or longer. In 2 cases there were never adequate precipitating factors; in the other 3 there were no adequate precipitating factors for any attack except the first one. All 3 patients lost their symptoms and, although one of them has since entered a mental hospital on account of personal inadequacies, none has had a recurrence of actual depression in the 2 years since operation.

There remain 4 cases whose illnesses seemed quite different. All were chronically inadequate people with a tendency to hysterical reactions: all were immature, dependent, dissatisfied with themselves and, through past experience and awareness of their own deficiencies, more or less constantly expectant of misfortune. Their illnesses seemed clearly related to their dissatisfactions and their fears: both the symptoms shown and the course of illness could be so interpreted without straining the facts; further, their states could be markedly influenced at a given time by appropriate stimuli, so that they showed variation to outside events as well as to their own thoughts. They could be brought to brightness and animation, could be removed from self-absorption, could be induced to show a wider interest. In fact, all showed reactivity. All 4 cases lost their depression rapidly, though one—12 months after operation—went through a remarkable paranoid phase which seemed to be enabled to reach expression through a post-operatively increased confidence and outspokenness, which enhanced her resentment over certain changes which had occurred to her disadvantage in her work situation during absence through illness.

Thus, while in our recurrently depressed cases the rate of recovery with absence of relapse is markedly better than in our frankly manic-depressive cases, there is evidence of persistence of symptoms after operation, with consequently slow recovery in 4 out of the 23 cases considered to be ill on a constitutional basis, with relapse into depression or mania in 2 more. Four out of the 23 cases, therefore, have shown a delayed recovery, and this was apparent only in those cases who had been ill for more than 2 years. In the 4 cases who were considered to be ill on an essentially reactive basis, in the sense that the illness was determined by the reaction of the personality to events outside the physical structure there were no cases of delayed recovery, although all had been continuously under treatment for depressive states for more than 2 years. It may be that here there is a hint of some difference in kind between two forms of depressive illness.

(4) We come now to consider our group of 36 cases who have had single depressive illnesses. But of these there are 18 who seem to form a rather special group bearing a resemblance to what is often described as "involutional melancholia." The status of involutional melancholia has long been a matter of dispute. Kraepelin considered it "quite different" from manic-depressive psychosis in 1904 (56), defined it in the seventh edition of his text-book as including "all pathological states of anxiety in more advanced age which are not episodes in the course of other forms of insanity," but in the eighth edition grouped it together with manic-depressive conditions as part of the same disease process (57, 58). This *volte face* arose largely from some remarks made by Dreyfus (27) after examination of some of the patients and of the case-records on which Kraepelin's original view had been founded. But Dreyfus' criticisms have themselves been strongly criticized, notably by Hoch and MacCurdy (52) and by Henderson and Gillespie (51). Lewis objects to the independent status of involutional melancholia on the ground that precisely similar cases also occur early in life (61). Farrar and Franks (32) have also concluded that depressions around the menopause show no distinctive characteristics other than can be accounted for by the age factor. On the other hand, Strecker and Ebaugh consider involutional melancholia, though probably a subdivision of manic-depressive psychosis, to merit special separate description by virtue of (1) its special age incidence, (2) its lengthy course, (3) its distinctive symptomatology (97), and substantially the same view is expressed by Henderson and Gillespie, while Noyes (77) observes that "in addition to its affective characteristics there are special physiological and psychological factors of such dynamic importance and so peculiar to that period of the individual's life during which the mental disturbance occurs that separate consideration is justified." Hoch and MacCurdy, in a classical paper on the subject (52), also regard the concept as worth retention, remarking that between the extremes of the depressive phase of manic-depressive psychosis and in-

volutional melancholia there is a marked contrast, though between them there are also innumerable transitions. They conceive of two types: (1) with a marked emotional reaction, usually anxiety and restlessness, with prominent delusions of death and poverty, to which peevishness and hypochondria may be added, though not sufficiently well developed to be consistently dominant features in the psychosis; (2) with, instead of frank fear reactions, much moaning, whining, surliness, seclusiveness, together with restriction of interest in about half the cases, while though death and poverty ideas are present in much the same proportion as in the first type, hypochondria is in this second type more prominent. They regard the first type as related to manic-depressive psychosis, and the second as related to schizophrenia. The prognosis is correspondingly considered by them to be worse in the second group than in the first. This view was to a large extent borne out by a later study of 68 cases by Drobnes (28), except that his figures seem to show that introverted personalities carry a better prognosis than extraverted. A somewhat different view is put forward by Davidoff and Brew (24), who consider the condition to be compounded of the personality changes and neurotic symptoms which arise at this catabolic phase of life, together with the "previously more specific individual personality attitudes and adaptations," so that the psychosis takes different forms according to its being primarily a matter of psycho-neurotic states imposed on the involutional symptoms (the "involutional symptoms" intended presumably in a more purely physical sense), or primarily of the involutional symptoms colouring the pre-existing state, or of its being some essential compound of the two. It is their opinion, contrary to that of Hoch and MacCurdy and of Drobnes, that though the early personality influences the occurrence of the psychosis, it does not influence its outcome.

Palmer and Sherman (79), on the other hand, viewing the condition as a definite entity and chiefly of psychic origin, consider that there is a definite personality type which predisposes to the development of involutional melancholia; this is characterized by introversion, strong conscious repression, obsessional characteristics, sado-masochistic tendencies, sexual maladjustment, hyper-religious trends leading to chronic worrying, undue meticulousness, denial of pleasure, pathological inhibition and rigidity. To this formidable list a later paper by Palmer, Hastings and Sherman (78) adds narrowness, poverty of affect and absence of normally warm relationships.

Titley (99) has also mentioned pre-morbid rigidity, and constriction of interests as characteristic.

Malamud, Sands and Malamud (64) likewise regard this condition as a clinical entity occurring in persons of a particular personality type, but they have a conception of the pre-psychotic personality somewhat wider than that of Palmer and Sherman, and include the (1) hard-driving, aggressive, over-conscientious and stubborn; (2) seclusive, autistic, under-active, prudish; (3) sensitive, timid and hypochondriacal, but all with rigidity and constriction of interest as the keynote. Noyes (77) would add to these persons who have been disappointed.

A catalogue of personality traits of this sort would seem to constitute an illness in itself, apart from the addition of melancholia, but Eyman and Rivers and their associates (30), surveying 300 cases of involutional melancholia, did find that the significant factors in the pre-psychotic personality were obstinacy, parsimony and perfectionism, while their series had an unduly high incidence of educated patients, and gross sexual maladjustments were present in a minimum of 25 per cent. of females and 16 per cent. of males. As regards precipitating factors, they found that in women, bereavements figured three times as often as any other, and in men financial worry occurred twice as often as any other. They note that Farquharson (31) had also found these the most prominent situational factors. Doty (26) has made a similar observation, but adds that reduced physical fitness, or the threat of it, are also of importance.

It seems, on the whole, legitimate to include involutional melancholia among our diagnostic subdivisions, and to regard it as an entity, with affinities both to manic-depressive psychosis and to schizophrenia, occurring in the later life of persons not previously subject to affective disturbance: characterized by depression with agitation and hypochondriacal features, and with a special tendency to be precipitated by bereavements, financial anxiety and the threat of poor health, in persons of rigid personality with inadequate social adjustments.

Eighteen out of our 36 patients with single depressive illnesses may be considered involutional melancholics. Of these, 10 may be best assigned to Hoch and MacCurdy's Group I (those more allied to manic-depressive psychosis) and 8 to their Group II (those more allied to schizophrenia and with a worse prognosis). Of these:

One patient, aged 70, was substantially unchanged after a 14-year illness of Group II type.

One patient, after a 10-year illness of Group I type, showed a post-operative state similar to that which we have already considered in one of our recurrently depressed patients. With every appearance of euphoria, he was giggly, flippant, and given to smart repartee, instead of being intolerably tormented, agitated and wretched. But he was quick to point out that his giggling was automatic, beyond his control, and provoked by silly things; such fatuousness, he added, was proof that he was an imbecile, as he had always said. His other self-depreciatory beliefs, such as that he was getting sillier and sillier, had ruined himself by masturbation, and was a "rotting mass of secondary syphilis," still persisted unshakeably, though he no longer cried them aloud. As to his mood, he would make no comment beyond saying that he hadn't one. "I don't feel anything at all; I'm not human; I see jam and I know it's jam, but it doesn't make my mouth water. I don't feel anything at all." That he was cheerful he emphatically denied: "I ought to be dead, and I wish I were." "It's queerer than anything in Edgar Allen Poe. Here I am; I'm not human, I'm useless, it's a tragedy, yet I laugh at it and see it has a funny side, but I haven't any feeling, and I ought to be dead." He was quite responsible, and able to do meticulously accurate work in the hospital office. Yet no one could say that he was well, or near it. It seems that here again is an instance of the "affective desensitization" of Mixter, Tillotson and Wies (72): that the central core of this illness persisted, that it was through a reduction in the elaboration of his emotions and thoughts and therefore of his agitation, that his attitude towards the illness had been altered. In 2½ years he has shown little further change.

Three other patients, ill for 7, 4 and 3 years (one of Group I and 2 of Group II type), were also improved by operation but not recovered. In 2 the depressive symptoms persisted for nearly 2 years, while the third (still unrecovered) died of a stroke in the tenth post-operative month.

The other 13 involutional melancholics recovered more rapidly. With regard to the time factor, 9 patients had been ill for more than 2 years, and 9 had been ill for less. The 5 patients who showed persistence of symptoms after operation were among the 9 who had been ill for more than 2 years. Of the 4 who, though ill for more than 2 years, recovered quickly, 2 had been comparatively mildly depressed with spontaneous fluctuations and some reactivity which had always stopped short of recovery, in a third the depression had also been mild but overlaid by a querulous hypochondriacal anergia, while the fourth (who had responded very well but always transiently to electroplexy) had actually been ill for 12 years with little spontaneous fluctuation.

Despite this last case, however, the evidence suggests on the whole that the longer a depressive illness persists in severe form without fluctuation or reactivity, the less good are the chances of relief by operation. For of 9 cases ill for longer than 2 years there were 4 (the most severely ill and the least reactive) who were still not recovered by 2 years after operation, and a fifth had died unrecovered in the tenth post-operative month; whereas, of 9 cases with illnesses of at least comparable severity but of less than 2 years' duration, none failed to recover. Two of the unrecovered cases were in Hoch and MacCurdy's Group I (with the more favourable prognosis), and 3 were in their Group II (with the less favourable prognosis). But in all of them, with or without situational factors, endogenous mechanisms were considered to have been paramount in the development and persistence of the illness.

Next in this group of patients with single depressive illnesses come 12 cases who were not involutionally melancholic. There were notable outside contributory factors in 8 of these 12 cases. Yet it seemed difficult, on common-sense grounds, to attribute the illness entirely to such cause. It was impossible to assign them definitely to one group or the other. All these 8 cases showed rapid relief of depressive symptoms after operation, though 2 of them later relapsed, again in situations which appeared contributory.

In the remaining 4 of these 12 cases it was felt that outside factors did little to precipitate the illnesses and contributed virtually nothing to their persistence. These were the cases with the least reactivity, in which the illnesses appeared autonomous. In 2 of these 4 cases there was only partial relief after operation, and the depressive symptoms persisted, though one of those 2 became fully recovered between the 12th and 24th post-operative months.

The time relationships here are also of significance. Three out of these 12 patients had been ill for 10 years. Of these 3, one who had been ill on an essentially endogenous basis did not recover, but the other 2 (who had shown reactivity) lost their depressive symptoms forthwith.

Seven patients had been ill for between 2 and 4 years. Of those, the one who had been unreactive and appeared ill on an essentially endogenous basis retained depressive symptoms for more than a year; the others (who had all shown reactivity) showed no post-operative persistence of depression.

Two patients had been ill for less than 2 years: they lost their depressive symptoms after operation.

Here again, then, it would appear that reactivity is a favourable prognostic sign, and it was only in the cases considered essentially endogenous that depressive symptoms persisted after operation.

This leaves us with 6 other cases who showed single depressive illnesses. All of these were considered to have been ill on a neurotic as opposed to a psychotic basis, in the sense that their states of depression seemed explicable solely in terms of the reaction of their particular personalities to their environmental stresses. These depressions were reactive; they were not autonomous; they were themselves a part of and identical with the patients' personalities. In none of these cases was there persistence of depression after operation, but all lost such symptoms. Two of them, it is true, showed later some degree of relapse. One had so far alienated her relatives that they could not tolerate her, so that when solitary and with nowhere to live, she easily fell back into a querulous and self-pitying ("Nobody wants me") state, and flung herself back on the hospital. The other found his powers of adjustment overtaxed by a marriage into which he had been persuaded when at his worst, and which he came to regret.

Thus, among the 6 neurotic cases with single depressions there was no post-operative persistence of depressive symptoms, despite the fact that all 6 had been ill for more than 2 years and 2 of them had been ill for more than 7 years.

(5) There was one case in which the depression appeared to be purely secondary to intractable pain from an atypical trigeminal neuralgia. After operation the depressive symptoms disappeared, although the pain persisted unchanged.

(6) There were 2 cases in which the illness appeared based upon, and essentially secondary to, obsessional characteristics. Neither patient was markedly ritualistic, but both were ruminative, unable to relinquish distressing trains of thought, and inextricably enmeshed in obsessional preoccupations of a frightening and gloomy nature. Both cases showed reactivity and could lose their depression if sufficiently beguiled, but neither could be beguiled for long. In both instances the illnesses were of many years' duration, and the depression had gradually come to be the clamant feature as a result of which hospital care became necessary. Both cases recovered without persistence of depressive symptoms after operation.

CONCLUSIONS.

We may summarize our findings as regards the recovery in these 6 groups as follows:

(1) In the manic and manic-depressive groups there was persistence of manic-depressive symptoms after operation in 9 out of 16 cases.

(2) In the group with recurrent depressions there was persistence of depressive symptoms after operation in 4 out of 23 cases, all considered to have been ill on an endogenous basis.

(3) In the group with single depressions there was persistence of depression after operation in 7 out of 22 cases considered to have been ill on an endogenous basis.

(4) In 8 cases in which it was considered that situational factors certainly, and endogenous factors probably, played a part, there was no persistence of depressive symptoms after operation.

(5) In 13 cases in which it was felt that endogenous mechanisms had played no appreciable part in influencing the depression (4 of them with recurrent depressions, 6 of them with single depressions, 1 of them reacting to intolerable pain, and 2 depressed secondarily to obsessional preoccupations), there was no persistence of depressive symptoms after operation.

(6) Thus, out of 61 cases believed to have been ill on an endogenous basis, there was post-operative persistence of symptoms in 20 cases. Out of 21 cases in which the illnesses were considered mainly reactive (in 13 of them entirely reactive) there was post-operative persistence of symptoms in none.

(7) With regard to relapse, as opposed to persistence of symptoms after operation, this occurred in 4 out of 51 cases considered to have been ill on an essentially endogenous basis.

(8) Relapse also occurred in 4 out of 21 cases in which the illnesses were considered to be largely or entirely reactive.

(9) The figures suggest that while reactivity carries a favourable prognosis as regards the immediate effects of operation, it carries also a greater likelihood of relapse. This is in accord with expectation, since the effect of the operation is but to modify, and not basically to change, the personality (81).

(10) The duration of illness, also; appears to exert less adverse influence on the effects of operation in those conditions that are mainly or entirely reactive than in those conditions which are more essentially endogenous.

It is the significance, if any, of these conclusions that we will now consider.

DISCUSSION.

It is necessary, of course, to consider first how far these figures can be accepted. The diagnoses themselves must be considered to some extent open to question, like many other psychiatric diagnoses. The distinction between endogenous and reactive conditions is not a matter that can be decided by measurement, or that is susceptible of proof. It must depend on an impression, and impressions are dangerous. The family histories were, on the whole, unhelpful in the differentiation. The principal criteria in attempting to distinguish between the endogenous and the reactive illnesses have been, as regards the former, the shape and massive form disproportionate to the situational factors and to what has gone before; and, as regards the latter, the intelligibility of the condition in terms of psycho-dynamics, and the reactivity. But apart from this, the illnesses seemed different in quality, though to convey the difference in words would tax the abilities even of a professional writer of long experience. The "neurotic" illnesses were of a quality much more personal to the patient, and more intimately bound up with those individual patterns of reaction which arose from their particular personal characteristics. The illnesses did not have the same stamp, as did the others, of having struck the patient from without, and of being alien to their normal states. There was about them a curious note of acceptance by the patients, so that they were described in a fashion showing the patient to have difficulty in explaining what symptoms were normal for himself, and which were not. The symptoms themselves varied widely, not only from case to case but from time to time in the same case, so that the clinical picture was inconsistent, though all complained of depression. The illnesses seemed to have merged out of the personalities, and the patients to have acquiesced in—almost to have encouraged—their development.

In this difficult exercise of projecting oneself into the patient's situation and judging it in the light of common sense, there are so many imponderables and uncertainties, as well as biases arising from the observer's own personality, that exception may be taken even to attempting it as being too far fraught with possibilities of fallacy. But the histories were taken with care, the patients were interviewed at length, discussion was held with the responsible doctors and nurses, much indispensable help was obtained from the relatives. In the writer's opinion, a reasonable judgment is not necessarily as impossible as many recent writers in the literature would lead one to suppose. In so far as it is a matter of opinion, the conclusions cannot be more than speculative, and to make further speculations arising from them may be to invite that criticism so trenchantly voiced by Halstead (48) that studies of prefrontal leucotomy have resulted only in the "pyramiding of unknowns." Yet the advancement of science has been due to the formulation of postulates, which have later been corrected as the development of knowledge has proved them to be wrong.

Now that it has been found possible to relieve affective disorders, in a number of cases at least, by interference with neural pathways, it seems that the future holds a real possibility that we shall be able to relate symptoms to lesions, in terms of disordered function of anatomically localizable structures, as in other branches of medicine. Here we are again reminded of Mapother's remark (65): "To assume that an enduring physical basis for habitually abnormal behaviour is probably non-existent because at present its exact nature is not demonstrable seems to me a flat defiance of all relevant experience in medicine."

Now, the operation of prefrontal leucotomy has shown that, as part of the changes which it may effect, it is possible to alter the patient's attitude towards an underlying condition without altering the condition itself. The best example of this is in the case already cited, where the patient post-operatively had still the same intractable pain, but did not suffer to the same degree. If, then, there exist endogenous affective disorders for which there is an underlying physical basis, it should be possible to alter the attitude of the patient towards such a condition without removing the disorder itself. In fact, this seems to have happened in 20 out of our 82 cases. Here we would seem to have examples of "an enduring physical basis." But that the physical basis is not always enduring in a permanent sense is indicated by the fact that, notwithstanding incomplete relief immediately after operation, many of these 20 cases have shown a slow and gradual tendency towards post-operative recovery, sometimes over a period of nearly 2 years. Further, it may be borne in mind that—largely owing to geographical exigencies—few of these 82 patients were personally seen by the writer until 6 months had elapsed since operation. There is thus the possibility that a number of other cases may have shown the same slow, but less slow, trend towards recovery with persistence of post-operative depression for some part of that 6 months.

Where is this "enduring physical basis" to be located?

Anatomical Considerations.

Both the underlying concepts and the technique of prefrontal leucotomy have changed much since the bold but naïve ideas of Moniz (73) first led him to begin this work in 1935. The severance, to a greater or less extent, of the thalamo-frontal radiation is now the avowed object of the procedure. This is the stream of fibres which runs forward from the dorsal medial nucleus of the thalamus to the frontal poles. The work of Meyer and his collaborators (70, 71) makes it now seem certain that, despite early doubts (69), section of these fibres is of major importance in achieving the post-operative effects. This is in line with the contention originally put forward by Freeman and Watts (36, 37, 38) that the beneficial results of operation were in some way dependent on that degeneration of the dorsal medial nucleus of the thalamus which they had noted in their own post-mortem material, and which occurred as a result of cutting the thalamo-frontal fibres. Recognition of the fact that the changes resulting from this manifest themselves mainly in the emotional sphere has done much to clarify the confusion of thought that previously surrounded the problem of the functions of the frontal lobes. It used to be held by clinicians that these were association areas on the integrity of which the intellectual life depended. But the unrivalled opportunities afforded by the 1914–18 war for observing the clinical effects of head injuries brought no definite evidence in favour of such a view. Both Forster (34) and Feuchtwanger (33) concluded that, though injury to the frontal lobes was followed by lack both of initiative and of emotional control, primary intellectual impairment did not occur. Kleist (55) believed that there was some localization in that emotional disturbances followed injury to the orbital surface, while intellectual and hypokinetic changes followed damage to the convexity. In the former conclusion he echoed the observations of Leonore Welt in 1888 (103), and in the latter he has to some extent been confirmed by the recent findings of Penfield (82). With the development of intracranial surgery, enormous resections of frontal lobe tissue without gross changes of purely intellectual kind have been reported by Dandy (22, 23), Ackerley (1) and Brickner (7, 8), while Jefferson's results (53) indicated that as long as one side only was affected no deficits resulted from a unilateral lobectomy. Indeed, Lidz (63) with detailed tests was unable to demonstrate any intellectual impairment on one of Jefferson's later cases. Finally, Hebb and Penfield (49) reported a case with bilateral removal of the frontal lobes, allegedly with no intellectual deficits at all, and this view was re-affirmed by Hebb (50) on re-examination 6 years later. Goldstein (44, 45), on the other hand, has always maintained that a particular form of intellectual impairment does follow frontal damage, though special methods of examination are required for its demonstration ; and Rylander's admirably detailed studies of 32 cases with various excisions of the frontal lobes render it hard to escape the conclusion that the more thorough the examination the more is something in the way of deficits likely to be found, though these may not be such as to form any notable handicap in the life situation (89).

Thus, though it is improbable that the frontal lobes are of no importance in intellectual function, they would seem less essential in that connection than used to be supposed, and attention has come to be focused more on the role that they play in the emotional life. This is in line with the suggestion of von Bonin (102) that, on comparative grounds, it is the temporo-parietal region, rather than the frontal lobes, which shows the greatest evolutionary development in man, and which is probably responsible for his intellectual ascendancy. Such a view also brings clinicians into more agreement with anatomists, who have long regarded the frontal lobes as receptor areas for hypothalamic stimuli rather than as association areas (14). Certainly the anatomical arrangements suggest this, and it would appear that the hypothalamic stimuli reach the frontal cortex via the thalamus, and mainly via the dorsal medial nucleus of that structure. The hypothalamus, thalamus and cortex are thus to be regarded as the component parts of a co-ordinated system, mutually interdependent and reciprocally influencing each other. Colour is lent to this view by the further discovery by Meyer (14) not only of fronto-thalamic connections, but of direct connections between the frontal cortex and the hypothalamus itself. It is with this co-ordinated system that the operation of pre-frontal leucotomy interferes by dividing the thalamo-frontal radiation, and thus (to a greater or less extent, according to the size of the incision) isolating the frontal poles, on the one side, from the thalamus and the hypothalamus, on the other. The effect of this must be to abolish, or to reduce, the passage of stimuli from the hypothalamus and thalamus to the frontal poles.

There is evidence that these stimuli must be concerned with the conscious experience of emotion.

PHYSIOLOGICAL CONSIDERATIONS.

The importance of the autonomic system and its connections in the mediation of emotion had long been apparent as the result of observations by Cannon (12), before Bard (4), by a series of painstaking experimental ablations of progressively larger areas of brain tissue in animals, showed that the posterior nuclei of the hypothalamus were indispensable for the appearance of those bodily emotional changes which Cannon had called "sham rage." Ranson

(88) further showed that "sham rage" was producible to order by electrical stimulation of the hypothalamus, while the work of Gellhorn (40), attempting an even more precise localization, suggested that this reaction was mediated essentially by the mammillary bodies.

But that these states producible by interference with the hypothalamus are the bodily expressions of emotion only, and with a qualitative difference from emotion as experienced in consciousness, has been most ingeniously shown by Masserman (66), who, just as Cannon called his effects sham rage, calls these "pseudo-affective." He introduced electrodes into the hypothalami of cats and left them there, so that the animals walked about with them as part of their permanent anatomy. When electrical stimuli were applied the cats would show all the outward appearances of rage, but, somewhat like our more irritable patients after leucotomy, would be immediately tranquil on cessation of the stimulus and would continue what they had been doing as though nothing had happened. This evidence was suggestive, but it was clinched by further experiment. Attempts were made to establish conditioned reflexes in these animals by presenting them, immediately before electrical stimulation of the hypothalamus, with such outside stimuli as noises, lights and currents of air; it was expected that, under the influence of conditioning, exhibition of the outside stimulus would produce the sham rage without need for electrical stimulation. But nothing of the sort happened, and the cats looked on these outside stimuli unmoved: it appeared that they had not associated the stimuli with any *feeling* of emotion. Similarly, when conditioned reflexes had been established in the cats in the ordinary way, it was found that these could be obliterated by presenting outside stimuli designed to make the cat annoyed: but they were not obliterated by mere stimulation of the hypothalamus. In fact, the outside stimuli annoyed the whole cat; the hypothalamic stimuli alone annoyed only the cat's autonomic system. Or, more accurately, the hypothalamus mediated the somatic expression of the emotion, but without the subjective experience.

Further, the hypothalamus appears to exert decisive influences on the bodily economy as a whole—on the pulse and respiration rate, the level of the blood pressure and blood sugar, the degree of hydration and dehydration, the general endocrine state (via the pituitary body, with which it is connected by the supra-optico-hypophyseal tract), and the wakefulness or sleepiness of the person. In fact, it is hypothalamic activity that determines the tensions at which we live, and that provides the milieu within which conscious experience becomes possible.

As to the means by which conscious experience becomes possible we know nothing, though we have a glimmer of knowledge as to the level at which this occurs. It appears to take place in the thalamus, which, as the great receptor centre for afferent stimuli, seems somehow to integrate these stimuli into percepts and to endow them with feeling tone. Papez (80) suggested in 1937 that the integration took place through the receptive nuclei in the ventral part of the thalamus (lateral geniculate body receiving optic stimuli, part of the reticular nucleus receiving stimuli from the spino-thalamic and trigemino-thalamic tracts, nuclei in the mammillary peduncles receiving stimuli from the medial lemniscus) and their connections with the pars optica and tuber cinereum of the hypothalamus, which in their turn connect with the mammillary body, which in its turn receives afferents from the fornix, mammillary peduncle and medial bundle of the fore-brain. He conceived that after integration in the thalamus the stream divides, so that those components relating to (1) the stream of movement, pass through the dorsal thalamus and internal capsule to the corpus striatum; (2) the stream of thought, pass through the internal capsule to the lateral cortex; (3) the stream of feeling, pass through the ventral thalamus to the hypothalamus, via the mammillary nuclei to the anterior thalamic nuclei, and thence to the gyrus cinguli. Incoming stimuli of cortical origin, having passed along a neural chain via the hippocampus and fornix to the mammillary body, are likewise relayed via the anterior thalamic nucleus to the gyrus cinguli. It is in the cingular gyrus, he concluded, that experience is endowed with emotional consciousness. But that conscious experience, if of a primitive kind, can occur actually at the thalamic level has been shown by animal experiment, for a decorticate cat will show rage at a barking dog (14*a*). Further, the results of prefrontal leucotomy would suggest that the post-operative changes in the affective life of the patient must be associated with the division of the thalamo-frontal fibres, and resultant degeneration of the dorsal medial nucleus of the thalamus. It would therefore appear that consciousness is possible at the thalamic level, but is elaborated at the cortical level, and—although the cingular gyrus is likely to play some important part—that this is also achieved through the relay to the frontal cortex of stimuli passing from the dorsal medial nucleus.

We might then summarize the matter by saying that it seems probable that the hypothalamus, thalamus and cortex function together in a co-ordinated relationship. The hypothalamus provides the milieu within which it becomes possible to experience in consciousness those integrations of stimuli into percepts, with their accompanying emotional investments, which are the products of thalamic function. The enlivening effects of hypothalamic activity are made felt through these integrations, are relayed through the dorsal medial nucleus to the frontal lobes, where, with ever-widening chains of association, and with modifications or elaborations according to those associations, the affective life finds its most mature and richest expression. The process, it must be presumed, is a reciprocal one in which both cortex and lower centres function as a unit with interplay and mutual influence. Feelings thus mediated will arouse other feelings, and these will form promptings to activity, which, translated into action, will result in movement and speech of every grade of complexity. Such a process may, perhaps, find its fullest expression in persons who are the subjects of mania; its greatest reduction in those akinetic depressions which Kraepelin considered typical of the depressive phase of manic-depressive psychosis.

Inferences as to the Nature of Affective Disorders.

That some such sequence does, in fact, occur in manic-depressive psychosis seems probable. It is well known that affective changes can occur as a result of lesions at hypothalamic levels. Fulton and Bailey (39) in 1929 drew attention to the fact that "manic attacks" occur with tumours at the base of the brain, but not in cases of tumour of the hemispheres, and recorded having seen three cases of maniacal excitation after operation for hypophyseal adenoma. Guttmann and Hermann (47) tell of a woman who had a manic attack with recovery at 27, followed by a phase of severe anxiety, excitement, irascibility and aggressiveness at 49, after which she died; autopsy disclosed a tumour of the third ventricle invading the hypothalamus from the chiasma to the corpora mammillaria. Foerster and Gagel (35) and Bumke and Foerster (9) describe how manic responses (manifested by push of talk, clang associations and flight of ideas) could be elicited by manipulation (while operating for its removal) of a suprasellar craniopharyngioma which compressed the floor of the third ventricle; and manic excitement, in a patient who had never before shown such tendencies, on attempts being made to remove a blood clot in the third ventricle; and a "manic reaction with euphoria" (push of talk, flight of ideas, psycho-motor over-activity) in a patient with a hypophyseal tumour compressing the hypothalamus. Alpers (2) has vividly described the behaviour (which he conservatively and correctly prefers to call "manic-like" rather than manic) of a patient with a teratoma involving the third ventricle. Cox (16) has recorded attacks of "mania" occurring in a racehorse later found to have a basal lesion, and more significantly, phases of apathy with affective loss in a woman in whom autopsy revealed a pinealoma.

Here, then, we have suggestive evidence of an "enduring physical basis" for affective disorders. It would seem probably to be located in the hypothalamus, but to make its effects felt also at the thalamic level, on account of the intricacy and intimacy of the anatomical connections. It would thus appear to be a dysfunction of those cell groups which mediate the somatic and subjective components of emotion. Such a dysfunction would account for the chronicity and apparently autonomous nature of some of the cases that we have considered. It would account also both for the persistence of symptoms after operation and for their recurrence. For, if the enduring physical basis be thalamic and/or hypothalamic in site, to operate on the thalamo-frontal radiation is to operate above the level of the lesion.

If we are correct in our conception that the thalamo-frontal radiation relays to the frontal poles what we may call for convenience "emotional stimuli" which are the products of thalamic and hypothalamic activity, and that these are elaborated, enriched and prolonged by the awakening of associations in the frontal cortex, then it follows that to divide the thalamo-frontal radiation is merely to reduce—by limiting the number of available pathways and by partly destroying the dorsal medial nucleus—the extent of the elaboration that can occur. The underlying disorder, however, would be left unchanged.

It seems that this is, in fact, what has happened in many of our cases. Some of the manic cases persisted in mania, but in a less elaborate mania, while those who showed recurrences showed them in a modified form. Some of the depressive cases persisted in depression, but with a great reduction of agitation, distress and complexity, so that they tolerated the disturbance of mood in simpler fashion.

It is therefore tentatively concluded that this may be the sequence of events in manic-depressive psychosis. It would seem that such a dysfunction can occur in the absence of psychic stimuli from the higher centres, or at any rate where such stimuli play an essentially secondary part in the development of the disorder. It is, for example, exceedingly difficult to think that certain regularly recurrent affective conditions (such as that described by Klein and Nunn (54), which underwent a regular weekly manic-depressive cycle with 5 days of depression and 2 of mania ; and the instance already mentioned in our own case-material in which the patient alternated on alternate days) can be so rhythmically influenced by their psychic stimuli. But it would also seem that, though such dysfunction may start in the absence of psychic stimuli, it is, in fact, precipitated by the latter more often than not, and that, once it has started, it can be maintained by them. It is possible that here lies the explanation of the ordinary recovery, as well as of those curiously slow recoveries that we have noted in some instances to follow operation, where the agitation and distress having been post-operatively reduced, it seemed that by that very removal the patient was enabled to make spontaneous improvement. It might be that, by the comparative isolation (through operation) of the lower centres from the higher, the former were released from noxious influences transmitted before operation, perhaps by the fronto-thalamic and fronto-hypothalamic connections which, it has been noted already, Meyer has recently shown to exist. Such a conception has something in common with Cid's original suggestion that the *modus operandi* of leucotomy might lie in "putting the injured part at rest" (13).

As to the nature of this dysfunction, and to what, in its turn, it may be a reaction, we are in the dark, and much patient work has failed to solve the difficulty, though—taking into account that it is possible to postulate a genetic basis for such conditions as involutional melancholia and manic-depressive psychosis—it must be presumed to arise from a constitutional predisposition. Whitehorn (104) was unsuccessful in finding any abnormality in the blood chemistry of manic-depressive patients. Baird (3) has sought to explain this by a conception of mania as a massive over-action of the entire autonomic system with both sympathetic and parasympathetic components functioning powerfully but equally, and thus maintaining homoeostasis, while he explains its prolongation by postulating a sustained alteration of the vascular bed in the way that Wolff and Wolf (106) consider to happen more transiently in states of rage. Although he failed to produce changes in a depressed patient by transfusion of 500 c.c. of blood from a manic one, he produced striking changes, and claims to have, in adrenalectomized cats and rats by transfusion of blood from human manics, which did not follow transfusion of blood from human normals. It is possible, therefore, that the metabolic changes so often stressed by Kraepelin may be factors of influence in affective disorders, possibly through an altered relation between the hypothalamus and the anterior pituitary, with secondary effects on other endocrine structures. This is the merest speculation, but even altered behaviour in cats and rats in such experimental circumstances shows that the possibility of metabolic changes, whether arising from hypothalamic dysfunction or leading to it, must not be overlooked.

The work also of Elvidge and Reed (29), who found suggestive changes in the oligodendroglia both of schizophrenic and manic-depressive cases when sections taken from living subjects were compared with controls, is a further indication that metabolic or physio-chemical changes may be at work.

It remains for us to note, however, that post-operative persistence of depression (which we have inferred to be evidence of an "enduring physical basis" for the affective disorder) was found in none of our cases except those considered to be ill on an endogenous basis. This raises the question of whether there is or is not a difference in kind between these patients and those whom we considered to be ill as a reaction to stimuli lying outside the physical structure. It would seem that there are some cases in which the patient reacts to disagreeable events (whether present in the outside world, or having arisen there as the result of his own behaviour, or whether they are more subjective in the form of feelings of inadequacy or conflict) by having disagreeable sensations, and that these are mediated by neural circuits from the cortex via thalamus and hypothalamus and back to the cortex again. This is a procedure of outside cause and inward effect, and the effects vary with the causes in a more rather than less physiological way. As the patient makes his adjustment (whether to the outside world or within himself) the effects cease as the causes no longer continue to operate. It is felt that this might be the sequence of events in "reactive depression" and in depressions of neurotic origin, and there seems no need in such cases to postulate any pathological process. The absence of the latter would constitute the difference between the reactive depression and the endogenous one, which last may not involve reaction to events outside the physical structure (at any rate at the onset), may be mediated by the same sort of neural circuits, but is more rather than less pathological, with some essential morbid process in the structure shown by dysfunction (to which the patient is genetically predisposed), mainly at the hypothalamic level and not essentially dependent on cortical impulses. Unlike the reactive depression, therefore, it is not necessarily resolved when the precipitating factors outside the physical structure are removed.

Summing Up.

In this way we conceive of two types of depression, and such a concept goes some way towards explaining the different results achieved by pre-frontal leucotomy in different kinds of affective disorder. Our considerations suggest that the operation is likely to prove of most immediate value in those cases in which the psycho-dynamics play a decisive part, whether they do this by themselves determining the condition without the development of any structural pathological change (as we believe to happen in reactive states), or by precipitating such through their action on hypothalamic centres constitutionally predisposed to dysfunction, or by maintaining, through repeated stimuli, such dysfunction once it has begun (as we believe happens in endogenous states). They suggest further that in some cases, but not in all, there is a more or less enduring physical basis for affective disorders. This is apparent in many of those cases here considered to have been endogenous, but in none of those cases considered to have been reactive. In the endogenous conditions, presumably by virtue of this physical basis, there seems to be a time factor which militates against recovery. In the reactive conditions there was no evidence of such a time factor. The apparent existence of this physical basis for the symptoms in some conditions but not in others suggests that it is not merely permissible, but desirable, to conceive of affective disorders in terms of endogenous, on the one hand, and reactive, on the other, though it is recognized that the clinical differentiation may in some cases be impossible, and that in many cases both factors may operate, probably to varying extents.

If there is truth in this concept, however, it should be pursued both in the interests of academic accuracy and in the hope of more precise observation yielding future contributions to knowledge. With one of Lewis's conclusions it is difficult to agree, namely that the term reactive depression and the grouping it denotes would be better done away with: from another, which he shares with Schultz, it is impossible to differ, namely, that we should always ask, " How far are reactive processes, in the widest sense, concerned in this case, and how far obscure hereditary or somatic determinants of a fateful sort ? " (61).

As to the future, it would seem worth while to correlate the results of two different forms of treatment which, despite some similarity of effect, probably secure those effects in ways more widely different than would superficially appear, namely, electroplexy and prefrontal leucotomy. Where one succeeds and the other fails, or where one succeeds after the other where it had failed before (the occurrence of which has been pointed out by Dax and Radley-Smith (25)), some differential points might emerge which have hitherto eluded our notice. It is possible, with these modern treatments, that we have attended too much to the mood and too little to the general behaviour. We might pay more regard, on the one hand, to such aspects as sensitiveness and responsiveness with wider range of thought and action, with vacillation and indecisiveness amounting sometimes to what Muncie (75), quoting Meyer, has called " a poorly directed strenuosity with a certain restless chafing " ; and, on the other hand, as Sands (90) has suggested, to " the diminishing state of awareness with movement away from reality, increasing introspection with narrowed range of thought and repetitive preoccupation with a few ideas," with which is associated Kraepelin's " impediment of volition," and sometimes an apparent reduction of affect. (For Lewis's contention that in the melancholic there is an increase of affective excitability for painful affect, though it contains of course much truth, does not seem always to be true.)

Finally, although the most highly reactive disorders are those likely to receive most immediate benefit from prefrontal leucotomy, it does not follow that this is the treatment of first choice. Since it appears that in them the time factor is of least importance, there is the more indication for giving alternative methods of treatment an extended trial, in view of the irreversibility of the operative procedure and the risk of undesirable sequelae.

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INVESTIGATION INTO INTELLECTUAL CHANGES FOLLOWING PREFRONTAL LEUCOTOMY.

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Introduction.

This investigation is not concerned with the clinical indications or results of prefrontal leucotomy, but attempts to re-examine changes following the operation, especially in regard to the impairment of some of the manifestations of the highest integrative psychophysiological functions of the central nervous system that may bring about such alterations. Amongst these we were primarily interested in cognitive changes, but the interpretation of apparent cognitive changes led to the consideration of orectic alterations as well. Such changes have so far been impossible to localize exactly, but are considered to be partly related to the phylogenetically more recent parts of the cerebral cortex. Masserman (1946) compared the mechanism of shock treatment and leucotomy with the effects of alcohol and states that "its main actions are those of a cortical depressant," as manifested by impairment of finer perceptions and discriminations and a "constriction of the integrative field." He believes that shock therapies and leucotomy partly produce their results by temporary or permanent decorticating effects, "rendering the individual no longer capable of fine spun fantasies or elaborate delusions." These decorticating effects can be assumed to be reflected in cognitive, conative and emotional alterations following the operation. The interpretation of change following leucotomy presents many difficulties, one of them being that only dysfunction can be related to structural damage of the frontal lobe and not function. Another is that psychotics or severe neurotics operated upon usually do not have a sufficiently intact pre-operative personality to draw conclusions about the normal functions.

Several different theories have been advanced in explanation of the changes found after leucotomy. The performance on intelligence and other cognitive tests has been found by the majority of workers not to be significantly impaired (Halstead 1947, Robinson 1946, Kisker 1944, Brody 1946, and others). Orectic theories of change have, therefore, been expounded by some authors. Robinson (1946) believes that prolonged attention and deliberativeness are reduced. Malmo (1948) speaks of a diminished ability to maintain a set in face of interference. Penfield and Evans (1935) suggest loss of initiative and capacity for planned action, Brody (1946) a stripping of emotion in relation to the task set. Freeman (1942) believes that the post-operative changes follow emotional alterations. He explains them by a bleaching of affect attached to the ego.

Kisker (1944) speaks of an emotional re-channelling. Halstead (1947) has presented an important cognitive theory of impairment of biological intelligence after lobectomy, head injuries and similar lesions, but states that this impairment is not evident after bilateral subcortical lobotomy.

A minority of workers have argued, on the contrary, that intellectual deterioration does occur. There is considerable variety in the functions which have been found to be impaired and in the causal explanations invoked. Porteus (1944) using his maze-test, found that lobotomized patients often improved on their pre-operative level of performance, but showed an increased tendency to repeat mistakes and inability to improve as rapidly as a control group. Rylander (1948) found in a number of post-operative cases a lowering of I.Q., a reduced capacity for association and a tendency to think in a more concrete way. Malmo found after prefrontal lobotomy a slight drop in general intelligence and a significant reduction in vocabulary; he explains this in terms of his conative theory. Yacorzynski, Boshes and Davis (1948), studying exhaustively a single case of frontal lobotomy, found a decrease in I.Q. on two tests and attributed this to a reduced capacity for abstract reasoning. They speak of a reduced capacity to grasp complex relationships dependent on destruction of connection of the cerebral cortex with other areas of the brain. Kiskoff, Dennis, Lazovik and Wheeler (1948) found that many intellectual functions are impaired after frontal lobotomy, but that there is a gradual return of intellectual capacities. Cobb (1948), Hutton (1942) and Reitman (1947) also tried to explain the change found after leucotomy in terms of cognitive function.

Cobb (1946) speaks of short-circuiting and believes that associative functions of the frontal lobe are impaired. This contrasts with Le Gros Clark's latest conception (1948) based on anatomical evidence regarding the prefrontal lobes as mainly projection areas.

The extent of the lesion in the patients concerned in most inquiries has varied; usually but not always, it has been more extensive than in leucotomy proper. The general finding, however, has been that there is no significant relation between degree of impairment and extent of lesion or amount of tissue removed. (Halstead, Malmo and others.) This seems to indicate that the same amount of frontal lobe damage does not always lead to the same impairment, and that as far as the leucotomy technique is concerned, there is not only an uncertainty as to the exact localization of the cut, but also in regard to the sensitivity to frontal lobe loss. In general, however, it appears that the relatively posterior cuts have produced the more severe impairments.

Despite the generally negative psychometric findings, several neurologists, e.g. Goldstein (1944), Cobb (1941 and 1948), urge that intellectual deficit must occur after any injury to the frontal lobes. The finding of Jacobson, that monkeys show an impairment in immediate memory after frontal lobotomy, has been taken to suggest that a similar impairment must occur in man after similar lesions. Many clinicians are convinced that leucotomized patients do show an impairment in cognitive capacity, especially in memory and conceptual thinking, and that this is not disclosed by tests because they are not sufficiently sensitive or searching.

The general purpose of our inquiry was a psychometric investigation into possible impairment of memory and conceptual thinking with a clinical assessment of cognitive and orectic changes after leucotomy, which might throw light on the impairment disclosed by these tests. The psychometric tests were given to an operated and a non-operated group for comparison.

Clinical Assessment of Changes.

The leucotomized patients have been rated independently on clinical evidence (based on observation over a number of weeks) in regard to :

(*a*) General post-operative clinical status.
(*b*) Cognitive changes.
(*c*) Conative changes.
(*d*) Affective changes, on a scale :

1. Markedly impaired.
2. Somewhat impaired.
3. Unchanged.
4. Somewhat improved.
5. Markedly improved.

The improvement was assessed only on the basis of behaviour.

Changes concerning a patient's desire, wish or will could be studied in several different stages. Apathy has often been seen after an operation. In some patients all kinds of inducements or bribes were of no avail in getting them to take up any activity or occupation. This sort of change is generally more marked for the first few days following the operation, but often persists to a smaller degree. Some patients if confronted with a task, state that they are not trying as hard as they could. Others, however, show an improvement in volition ; they take more interest in occupational activities and show improved emotional expression and striving. Cognitive or intellectual changes are usually small and, therefore, more difficult to assess clinically. Some impairment of memory and judgement was, however, observed in a number of patients. It was assessed by studying the patient's performance in recreational activities, such as playing whist, and whether they went about their occupations more intelligently or not. Some examples may be of interest :

One patient who was usually quite particular about her belongings before the operation, afterwards proceeded to burn her dirty clothing which was otherwise in good condition. Another, while out for a walk, had no hesitation in entering the gardens she passed and proceeding to pick flowers. This latter kind of disturbance was hypothetically interpreted by Reitman as due to a loss of the abstract concept of ethics.

A journalist complained that ideas did not come as quickly as before the operation and that he was unable to muster the same interest and enthusiasm for his work, which change can be tentatively interpreted as an impairment of cognitive capacity combined with a decrease in conative functions.

OPERATED PATIENTS.

The operated group consisted of 24 patients, 7 male and 17 female. The age range was 21 to 68 years; the mean age was 37·8 years, S.D. 11·7 years. Nosologically, 17 were schizophrenics, 6 depressives, and 1 psycho-neurotic (obsessive-compulsive). The nature of the operation was: bilateral low vertical leucotomy 17, bilateral upper vertical leucotomy 2, middle vertical leucotomy 3, combined upper and lower vertical leucotomy 1, bilateral lobotomy (Freeman and Watts' technique) 1. So far as intelligence was concerned, the mean score of the operated group, prior to operation, on the 1938 Progressive Matrices (administration without time limit) was 36·4, S.D. 11·9, range of scores 14 to 56.

Operative Technique.

For a detailed description of the operative technique used for most of our case material, we refer to a recent publication by Dax and Radley-Smith (1948).

The skin and bone incision is about 3 cm. lower than in the technique used by Freeman and Watts. The centre of the skin incision lies 3 cm. behind the outer border of the orbit and 3 cm. above the zygoma. After opening of the dura, the vessels in the lower end of the Sylvian fissure are sought. This incision is very near the floor of the anterior fossa. A stab incision in the pia arachnoid is made at a point where an imaginary line 1 cm. above and parallel to the Sylvian vessels crosses a horizontal line just over the centre of the opening. The leucotome with its blade closed is inserted there. The direction in which it is intended to point is varied according to the particular sections of fibres to be cut. In the vertical plane an upper, middle and lower vertical leucotomy were used. Sections were also made in the horizontal plane in some cases, or several of the mentioned types of sections were combined. The original technique described by Freeman and Watts was also employed.

NON-OPERATED PATIENTS: CRITERIA OF MATCHING.

The goal was to have a control group of non-operated patients matched as closely as possible for age, intellectual level and clinical status. The criteria of matching adopted were:

1. Identity of sex.
2. Identity of general clinical status.
3. Difference in age not exceeding 6 years.
4. Difference in untimed Progressive Matrices score of not more than 5.

Matching by sex and general clinical status was readily achieved. It was not, however, possible with the available population, to secure a fine symptomatological matching and at the same time to match closely for intellectual level. As cognitive changes were chiefly under investigation, preference was given to the latter criterion. The age range of the matched group was 20 to 62 years; the mean age was 35·8 years, S.D. 10·6 years. It was possible to ensure a very close matching between the two groups on the Progressive Matrices scores. The mean score of the matched group was 36·8, S.D. 11·1, range of scores 13 to 57.

The high proportion of schizophrenics in the two groups was imposed by the nature of the operated group. Several workers, notably Rylander, have convincingly urged that, because of the notorious psychotic fluctuation in test-performance, investigations into cognitive and other changes after frontal-lobe operation should be restricted to psycho-neurotics. It may be noted, however, that the schizophrenic and depressive patients included in the two samples tested here were indubitably psychotic; the clinical status of leucotomized patients said to be psychoneurotic is often greatly open to question. (Reitman, 1948.)

Rationale of Psychometric Investigation.

The rationale of the psychometric inquiry was to apply a battery of tests that involved remembering or conceptual thinking to the leucotomized group, in the week prior to their operation and to apply a battery of similar (or the same) tests to them in the period six to eight weeks after the operation. The same two batteries were administered to the control group with an intervening period of seven to eight weeks. A minimum period of six weeks after operation was allowed to elapse because of the finding of investigators into physiological changes after leucotomy that the patient can be confidently regarded as stabilized at his new level by that time. (Reitman 1945, 1947, and others.)

The test employed were (1) Memory for Objects, (2) Paired Associates, (3) Verbal Similarities, (4) Specially devised Sorting Tests, (5) Reitman's Pinman Test, (6) Items from Kohs' Blocks, (7) Bender's Visual-motor Gestalt Test. The use of these will be more specifically described below and such quantitative and qualitative alterations as were evident will be stated.

If it is true that there is a deterioration after leucotomy in ability to remember and to think conceptually, it would be expected that the performance of the operated group on the second battery would be less effective relatively to their first performance than would that of the non-operated group. The situation on a test varies according to whether or not a practice-effect is involved and whether the second test is harder than the first, easier or of equal difficulty. Assuming that there is a deterioration of ability after the operation, there are four chief possibilities:

1. The operated group show a loss in score, while the control group remain at the same level.
2. The operated group show a loss (or remain at the same level) and the control group a gain in score.
3. Both groups show a gain, but that of the operated group is less than that of the control group.
4. Both groups show a loss, but that of the operated group is greater than that of the control group.

In all eventualities, if there is deterioration after leucotomy, the difference between the mean-score of the operated group on a pre-operative test and their mean-score on its post-operative parallel should be either significantly greater negatively or significantly less positively than the difference between the mean-score of the non-operated group on the first test and their mean-score on the second test. The statistical problem then is to determine whether or not this difference of changes could easily have arisen from the chance variability of sampling; this has been ascertained in the conventional manner by calculating students' t-ratio. The performances were also carefully scrutinized for evidence of fine qualitative changes.

TESTS EMPLOYED AND RESULTS.

(The main quantitative results are shown in a table in the Appendix.)

1. *Memory for Objects.*

The aim here was to apply a straighforward test of immediate and delayed recall, using everyday material. Fifteen common articles (scissors, pencil sharpener, etc.) were exhibited to the patient in a constant order at 5-second intervals. At the end he was asked to name as many articles as he could remember. The score was the total correctly named or described. Repetitions and paramnestic statements were noted, but neglected in the scoring.

For delayed recall the patient was asked, after three other tests had intervened at an interval of approximately 30 minutes, to name as many articles as he could still remember.

In the second testing the same articles were exhibited in the same order, and the patient's immediate and delayed scores determined in the same way. The difference in change between the two groups was non-significant. There was no evidence of an increased tendency to repetition or paramnestic statement in the operated group.

2. *Paired Associates.*

The test of paired associates has often been found a valuable indicator of diminished learning capacity owing to cognitive deterioration.

Five paired associates taken from the original Babcock Scale (earth-hole, cane-beat, lawn-cap, spark-tears, twig-song) were read to the patient in the first testing. He was told that he would afterwards be given the first word in each pair and required to say the word that went with it.

The test was carried on till the patient achieved perfection. The patient was allowed 15 seconds to recollect the second word; if he could not do so by that time he was told what it was. To prevent recollection by position the first words were read out in a systematically varied order. The score was the number of repetitions of the whole group of five words necessary for the patient to attain perfection; the optimal score was zero.

In the second testing, five pairs from Babcock's parallel list were employed (barn-mouse, oil-coin, ice-mumps, man-boot, lump-way). The administration and scoring were as in the first testing.

The operated group showed a marked mean increase in the number of repetitions necessary, the control group a slight mean increase. The difference in changes is significant.

The difficulty of tests such as Paired Associates can be greatly reduced by forming mental pictures of links between the words or otherwise linking them

Table of Quantitative Results.

Test.	Prior means.		Subsequent means.		Difference in change.				
	Operated.	Control.	Operated.	Control.	Mean.	S.D.	S.E.$_{m.d.}$	t-ratio.	df.
Immediate object memory	8·77	9·14	9·23	9·32	0·28	1·29	0·27	1·037	23
Delayed object memory	8·72	9·02	8·92	9·47	0·25	1·47	0·31	0·806	23
Paired associates	10·86	9·73	14·48	10·11	3·24	5·51	1·15	2·817	23**
Verbal similarities	31·24	32·81	31·45	33·26	0·24	1·31	0·27	0·889	23
Sorting, Part 1	3·90	3·58	5·02	6·71	2·01	3·46	0·72	2·792	23*
,, ,, 2	4·82	5·13	5·97	7·11	0·83	2·16	0·45	1·844	23
,, ,, 3	12·86	13·74	12·09	17·03	4·06	4·37	0·91	4·462	23**
Reitman responses	12·65	13·86	15·32	17·00	0·47	2·18	0·48	0·979	21
,, drawing	2·78	1·84	2·57	2·24	0·61	1·34	0·45	1·356	9
Kohs' Part I	28·23	25·94	19·68	16·83	0·56	2·75	0·57	0·982	23
,, ,, II	10·76	11·88	13·67	11·69	3·10	4·94	1·03	3·010	23**
,, ,, III	29·91	30·46	34·29	29·70	5·14	6·60	1·38	3·725	23**
Bender reproduction	21·32	19·52	18·32	20·81	4·29	5·16	1·08	3·972	23**
,, motor	10·98	10·24	10·89	10·64	0·49	1·81	0·38	1·289	23
,, counting	3·08	3·12	1·81	2·54	0·69	0·67	0·14	4·929	23**

* Statistically significant at 5% level.
** Statistically significant at 1% level.

by a constructed third term (e.g. twig-song, a bird sitting on a tree singing). It was not possible till the end of the second testing to find out how far this had played a part in the good scores of some patients. Such devices had been used by 2 of the operated and 3 of the control group, according to their statement. This factor, therefore, seemed not to play a great part in the results.

3. *Verbal Similarities.*

Both clinical experience and the researches of Wechsler and others indicate that the task of stating how two or more named objects are similar or alike is good evidence of capacity for conceptual thinking and of its impairment owing to various causes.

Two parallel lists of pairs or trios were constructed from alternate items of this sort in the Terman-Merrill and Wechsler Scales, starting with easy pairs, such as "wood and coal," and leading up to difficult ones like "life and death."

The patient was asked to say how the objects named were alike or similar, or what they had in common. The essence of this task is to disregard manifest differences and isolate a less obvious likeness. A fully adequate performance subsumes the objects under an appropriate class; a completely inadequate performance names only the differences. Between these possibilities there are varying degrees of inadequate abstraction owing to concreteness of thinking or awareness of differences. The following scale of marking was adopted:

3 *marks*.—Fully adequate abstraction, e.g. coal-wood, "both fuel."

2 *marks*.—(*a*) Abstraction with concrete components, e.g. coal-wood, "light fires with both."

(*b*) Good abstraction with difference also named, e.g. apple-orange, "fruit, but one red and other yellow."

1 *mark*.—(*a*) Concrete or situational conjunction with abstract component, e.g. penny-shilling, "both in your purse."

(*b*) Too wide abstraction, e.g. shoe-glove, "both objects."

(*c*) Too narrow abstraction, e.g. bee-sparrow, "both have eyes."

(*d*) Far-fetched abstraction, e.g. ocean-river, "you could drown in both."

(*e*) Mild inaccuracy, e.g. cow, snake, sparrow, "all have legs."

½ *mark*.—(*a*) Situational conjunction with no abstraction, e.g. fly-tree, "fly lives in tree."

(*b*) Marked inaccuracy, e.g. bee-sparrow, "two mammals."

0 *marks*.—(*a*) Statement of difference, e.g. bee-sparrow, "insect and bird."

(*b*) Denial of similarity, e.g. coal-wood, "not alike."

(*c*) Inability to answer at all.

The maximum mark on each test was, therefore, 60. The difference in mean change between the groups was non-significant.

A detailed qualitative scrutiny of the answers also suggested that there was no general tendency to increased difficulty after the operation in disregarding the differences and isolating what was similar.

4. *Sorting Tests.*

Several investigators into conceptual thinking have remarked that tests such as Verbal Similarities are unsatisfactory because they involve familiar material in relation to which there are well-established habitual modes of reaction. For this reason sorting tests involving unfamiliar material are regarded as preferable indicators of weakened conceptual thinking. Certain difficulties arose in choosing a suitable sorting test for this investigation. Some of the well-established sorting tests, such as the Hanfman-Kasanin are extremely difficult for all but the super-normal, others such as Weigl's Colour-Form test are too easy for all but the seriously deranged. Moreover, most of the well-known sorting tests are not capable of repetition, once the principles of classification have been grasped, and few have parallel forms. For these reasons it was decided to devise two special sorting tests which seemed likely to be of approximately equal difficulty.

The aim was to present the patient with a number of shaped pieces marked in various ways and capable of grouping into mutually exclusive classes according to the shape or various markings, with one number of classes corresponding to each kind of marking. In each test 15 pieces were used. In the first test, the pieces could be classed into three groups according to shape (square, circle or triangle), two groups according to a mark at the top (square or circle), four groups according to the number of times the letter V was marked on them, five groups according to the number of times a red X was marked on them, and six groups according to the number of blue dots on them. In the second test, the pieces could be classed into three groups according to the same shapes, two groups according to the mark at the top (X or XX), four groups according to the number of times a red S was marked on them, five groups according to the number of times a red O was marked, and six groups according to the number of blue straight lines on them. It was intended to determine, first, how quickly in order to make a given number of classes, the patient could isolate a common marking and disregard differences in marking, and, secondly, how quickly he could shift from one principle of classification to another.

In all sorting tests there is great difficulty in conveying to subjects of average or poorer intelligence and education what the nature of the task is. Subjects who have not had an advanced scientific or literary education often find the notion of classifying material exceedingly hard to grasp, quite irrespective of difficulties in carrying out the classification. It was necessary, therefore, to exercise special care that the patient understood the nature of the task.

The patients were first familiarized with the notion of classification by analogies. They were given coins to sort out and ways in which people could be classified were discussed—according to sex, occupation, rank, etc. Owing to differences in the intelligence and education of the patients it was not possible to adopt a fixed form here, but the process was carried on till the patient apparently grasped the notion of classifying with complete understanding.

The patient was then asked to sort the pieces into groups according to shape, then according to the mark at the top, and so on through all the other markings.

Nothing was said about the number of classes made each time and no patient remarked on this. Attention was, however, carefully drawn to the fact that in each classification a piece must belong to one group and only one group, and that all the pieces had something in common which the pieces in the other groups did not possess.

When this had been done, the patient was told "Now you've seen all the different ways these pieces can be grouped according to shape or markings. I want you next to arrange them into four groups so that all the pieces in a group have something in common that the pieces in the other groups haven't got, and so that no piece could be in any group but the one it is in. You can use the shape or any of the markings, but don't combine different sorts of markings." Where necessary the instructions were repeated till the patient grasped them. The patient was then given five minutes in which to achieve the classification. If he did not succeed by that time, the grouping was made and the patient was given up to five minutes to look at it and say on what it was based. Where wrong groupings were made, the reason for their incorrectness was pointed out. The sub-test was scored by deducting one mark from 10 for each complete minute the patient took during the two phases combined.

Next the patient was asked to make five groups some other way. The same procedure and method of scoring were used. Then the patient was asked, as an indication of his capacity, to shift from one aspect to another, to make the grouping of four again and then once more the grouping of five classes. For each regrouping he was allowed up to five minutes; one mark was deducted from 20 for each complete half-minute taken during the two regrouping phases.

Thus there were three sub-tests of sorting, the first two having a maximum of 10 marks each and the last of 20 marks.

In the second battery the parallel pieces were used with precisely the same administration and scoring, except that the elaborate explanation of classifying was not necessary. The similarity of the two tests would suggest the likelihood of a considerable practice-effect in the second performance. The control group showed mean gains on all three sub-tests; the operated group gained on the first two but lost slightly on the third sub-test. The difference in change between the two groups was significant on the first and third sub-tests, non-significant on the second. The difference on the first sub-test is suggestive that the leucotomized patients benefited less from their previous experience than did the non-leucotomized patients; the difference on the third sub-test is suggestive that on the basis of their previous experience the non-leucotomized subjects were able to make quicker shifts than were the leucotomized ones.

Qualitatively, subjects differ in their mode of tackling sorting tests of this kind. Some regard the material abstractly without making any efforts at physical trial-and-error sorting; others use the latter in varying degrees. Some make a systematic elimination of variables; others (not always of poorer intelligence) are unsystematic and manipulate or regard the material until the common component suddenly comes to the forefront of awareness. It was not possible to detect in the leucotomized patients any consistent change in these modes of approach. Sorting tests with schizophrenic and organic patients usually evoke a number of more or less pathological phenomena—

patterning with the pieces, distributions instead of classification with the variable, physiognomonic reference to the pieces, etc. In both samples such phenomena appeared in both testings, but no increased tendency to them was evident in the operated group after leucotomy. Qualitatively as quantitatively, the essential difference between the two groups was that on the second testing the non-operated patients seemed to show a marked improvement in isolating the common factor, disregarding differences and shifting from one principle to another, while the operated patients showed a much less marked improvement or none at all.

Reitman's Pin-man Test.

In this test the subject is shown a number of Pin-man drawings strongly suggestive of various emotional states and asked to say what feeling they express. The responses are marked according to the extent to which the subject can ascribe inner feeling to the figure, the degree of abstraction or generality by which he does so, and the presence of bizarre reactions. The subject is also required to draw one of the figures from memory and the drawing is marked by similar criteria to those for the responses. The test is essentially one of capacity to conceptualize emotional expression.

The Pin-man responses were obtained from 22 leucotomized cases before and after the operation, the drawing from 10. The results have been compared with their matches only. The Pin-man test consists of 12 figures altogether; half of these were presented in the first testing and half in the second. The maximum score on the responses was 30, on the drawing 8. Both on responses and drawing the difference in change between the two groups was non-significant.

Kohs' Block Designs.

Goldstein and Scheerer treat Kohs' Blocks as a test of abstract and analytical thinking. More usually it is regarded as a test of capacity to deal with spatial relations. In either eventuality it seemed of value in this inquiry.

It was decided not to use the entire series but in order that practice effects might be reduced to employ two parallel series of approximately equal difficulty. The first series consisted of Kohs' No. 3 as the first sub-test, Kohs' No. 7 as the second sub-test, and Kohs' No. 11 as the third sub-test. The parallel series consisted of Kohs' No. 2, Kohs' No. 8, and Kohs' No. 10 as the first, second and third sub-tests.

In order to give full opportunity for differences to appear, the patient was allowed unlimited time on each figure. On the first design, the score was the total time taken in seconds, on the second, the number of five-second intervals, and on the third the number of ten-second intervals taken. In each testing, the patient was first given Kohs' No. 1 design as a trial in order to illustrate the nature of the task. When the patient made an incorrect reproduction he was told that he was wrong, if he did not spontaneously say so, but left to find out why. The nine-block designs are often insuperably difficult for subjects of poor intelligence; to make them feasible in all cases, the blocks were here turned up to the correct sides and the task was merely to place them in the proper way.

In the second testing both groups showed a marked mean gain on the first sub-test, but the difference in change was non-significant. On the second sub-test the leucotomized group showed a mean loss, the non-leucotomized group a trivial mean gain. The difference in change was significant. The chief difficulty in doing the second sub-test (Kohs' Nos. 7 and 8), is the shift from a square to an oblique design. Qualitatively there seemed to be an increased difficulty in shift in the operated group.

In the third sub-test on the second testing, the leucotomized group showed a marked mean loss, the non-leucotomized group showed a slight gain. The difference between the groups was again significant. Qualitatively there seemed to be a definite increase of difficulty after the operation in breaking up or analysing the nine-block figure into its constituents and in relating the blocks to this analysis. No such increased difficulty was apparent in the non-leucotomized group.

Bender Visual-Motor Gestalt Test.

This test, developed by L. Bender from the Wertheimer Gestalt figures, is widely recognized as a delicate indicator of cognitive disturbance dependent on brain lesions.

The 9 Bender figures were used in both testings. Each figure was exhibited to the patient for 10 seconds ; he was then required to draw it from memory.

Bender's system of marking did not prove conveniently applicable to these groups. The following alternative system was employed.

3 *marks : Close resemblance to figure shown.*
2 *marks : Moderate resemblance to figure shown.*

- (*a*) Size considerably increased.
- (*b*) Size considerably decreased.
- (*c*) Components separated spatially.
- (*d*) Other slight spatial displacements.
- (*e*) Slight simplification of the figure.

1 *mark : Slight resemblance to figure shown.*

- (*a*) Omission of components.
- (*b*) Marked spatial displacements.
- (*c*) Fairly considerable simplification of the figure.

0 *marks : No resemblance to original.*

- (*a*) Complete inability to remember the figure shown.
- (*b*) Extreme simplification of the figure.
- (*c*) Pictorialization of figure (faces, animals, etc.).

This gave a maximum of 27 marks for the test. So far as possible, purely motor execution (straightness of lines, regularity of curves and circles, etc.) was disregarded in allocating the above marks ; the emphasis was on the fidelity with which the subject apprehended and retained the figure.

Motor execution was marked separately on the following scale for each figure :

2 *marks :* Good motor execution.
1 *mark :* Fair motor execution.
0 *marks :* Poor motor execution.

The maximum motor-score was 18.

In the second testing, the non-leucotomized group showed a mean gain in marks for reproduction of the figure, the leucotomized group a mean loss. The difference between the two groups was significant.

The difference in change between the samples so far as motor-scores were concerned was not significant.

The evidence suggests that leucotomy impairs the patient's capacity to reproduce the Bender figures accurately. Qualitative consideration of the reproductions made indicates that the change is chiefly in the direction of an increased tendency to spatial displacement, simplification of the figures and omission of parts.

One respect in which subjects differ on this test is that where there is a repetition of dots or other components in the figure some subjects carefully and systematically count them, while others rely on the general impression. It might be expected that after leucotomy this counting behaviour would be less evident. The phenomenon was investigated by giving one counting mark for each figure where counting was shown. As counting is possible on five figures the maximum was 5. Both groups showed a diminution in counting on the second testing, but the leucotomized group more markedly so. The difference in change was significant.

Changes on Psychometric Tests.

The changes suggested as probable by the foregoing tests would support the minority of investigators who have found evidence of impairment after leucotomy. In detail they were:

1. Diminished punctiliousness. (Bender counting.)
2. Diminished apparent capacity to analyse and reproduce unfamiliar spatial relations. (Kohs' and Bender tests.)
3. Diminished apparent capacity to form linkages in unfamiliar verbal material. (Paired Associates.)
4. Lesser apparent capacity than matched group to benefit from experience on first testing. (Sorting tests.)
5. Diminished apparent capacity to shift from one aspect of situation to another, taking into account previous experience. (Sorting tests and second Kohs' design.)

The first of these changes is clearly conative. The others might be interpreted either cognitively as a true reduction in capacity or conatively as a reduction in the effort made to master an unfamiliar task. Undoubtedly there were changes in attitude ; at least three operated patients made remarks to the effect, " I'm not trying as hard as last time," and none of the non-operated group spoke or behaved in this way. On the other hand, the leucotomized performance on Paired Associates and the Kohs' sub-tests was suggestive to the examiner of genuinely increased intellectual difficulty.

In order to relate the changes on psychometric tests to the clinical assessment of changes, the leucotomized patients have been given an approximate impairment—improvement rating in the following manner. On each of the six tests where significant differences in change were shown between the two groups, the leucotomized patients have been rated by the position of their change in score relative to the mean change and S.D. of changes of the non-leucotomized group, thus :

1. *Markedly impaired :* Adverse change 1½ S.D. or more from mean change of control group.
2. *Somewhat impaired :* Adverse change ½ S.D. up to 1½ S.D.
3. *Unchanged.*—Change less than ½ S.D. in either direction.
4. *Somewhat improved :* Favourable change ½ S.D. up to 1½ S.D.
5. *Markedly improved :* Favourable change 1½ S.D. or more from mean change of control group.

The ratings on the six tests have been averaged to give a general indication of impairment. The final ratings thus obtained corresponded fairly closely to the general qualitative impression of changes in the patient's performance.

The product-moment correlations between the impairment-improvement rating on the tests and the clinical ratings were :

(*a*) With general clinical status .	minus ·44
(*b*) With cognitive changes . .	·06
(*c*) With conative changes . .	·41
(*d*) With affective changes . .	·05

These figures are very approximate and tentative, but they would suggest two conclusions :

1. That general clinical improvement or deterioration is inversely related to improvement or deterioration on cognitive tasks, i.e. that the patients who are most improved clinically are those who are most impaired on the tests and vice versa.

2. That the changes on the tests are dependent on conative changes in the patient, not reduction in capacity.

Discussion and Comments.

Though the tests results were suggestive of true intellectual impairment the clinical assessment seemed to indicate that this impairment would also be explained on the basis of conative changes, that patients were not trying so hard after the operation and could not focus their attention as well and as persistently on the different tasks, thus confirming Malmo's theory of the incapacity to maintain a set. It is, however, impossible to explain the "impairment" by changes based on one factor alone. The mechanism appears more complex or global. Consciousness can be looked upon as the sum total of cognition, conation and affection. Modern neuropsychiatric conceptions of consciousness may provide other interpretations of the changes, as for instance outlined by Purdon Martin (1949). The acuteness of awareness embracing cognitive and conative and emotional aspects to the external and internal situation may be impaired, leading to a more detached attitude towards obsessions and delusions.

Cobb (1948) put forward the hypothesis that the impulses from the hypothalamus keep the thalamus "awake," and "ready to receive impulses from the cord and brain stem." "The neuron circuits from thalamus to cortex and back supply the mechanism for sustaining a stimulus by reverberation once the thalamus has been stimulated." "Consciousness is especially related to the cerebral cortex and the reverberating connections that exist between the cortex and thalamus." (Cobb, 1948). It is considered to be integrated at many different levels like other important functions of the central nervous system. An impairment at the highest level must be assumed following leucotomy.

Consciousness is also related to hypothalamic function (Russell Brain, 1949). This region is mainly concerned with the activity of the autonomic nervous system.

Autonomic disturbances after leucotomy were studied by Reitman (1945, 1947) and Rinkel (1947). Both found that the autonomic equilibrium is established on a new and higher level, thus homeostatic functions seem to be altered. Changed hypothalamic functions might, therefore, also have some bearing on the results seen after the operation, which would follow Cobb's hypothesis of the hypothalamus keeping the remaining parts of the thalamus more "awake."

The degree of cognitive and conative impairment might sometimes not be sufficient to reduce the awareness of very intense or torturing delusions. Other factors related to the mechanism of improvement like the "shock factor," can be largely excluded because all our patients had received some or other form of shock treatment, though definite brain injury might have an additional "shock" effect. It seems, however, that the super-imposed organic change, i.e. frontal lobe damage, often paves the way to further improvement. The continued clinical improvement cannot be explained only in terms of an impairment of cognitive or conative functions, as these also often improve in time. Perhaps it might eventually be found to be related to the influence of altered hypothalamic activities.

SUMMARY.

1. A group of 24 leucotomized patients were tested with a battery of tests involving memory and conceptual thinking in the week before their operation and with a parallel battery 6 to 8 weeks afterwards.

2. A group of 24 non-leucotomized patients, matched for sex, age, intelligence and clinical status, were tested with the same batteries over the same intervening period.

3. The statistical significance of the difference in the mean gain or loss on each test between the two groups was examined.

4. The leucotomized group showed a significant loss on Kohs' Blocks, the

Bender Gestalt test and Paired Associates. They gained significantly less than the matched group on Sorting tests.

5. The possible mechanisms of leucotomy were discussed. It proved impossible to reduce the impairment either to only cognitive or only conative changes. The neurophysiological aspects and the neuro-psychiatric formulations of consciousness were considered in relation to the mechanism of improvement.

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DELINQUENT TYPES OF MENTALLY DEFECTIVE PERSONS.*

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Delinquency is one of those vague but fashionable words that are becoming very difficult to define. Originally it appears to have been used to describe minor infringements of the social, moral or legal code, with special reference to acts of omission rather than acts of commission. It is now often used to describe any kind of anti-social conduct, whether trivial or serious, while some use it as a harmless euphemism for crime, although the word crime, in its technical meaning of an act or omission punishable by law, is inoffensive, and has no reference to the question of moral guilt or culpability. It is therefore perhaps advisable for me to say what meaning I attach to the word to-day. For the purpose of this paper I am using the word in the general sense of criminality, that is to say, I am confining my remarks to the more serious types of anti-social conduct shown by mentally defective persons.

There exists a great diversity of opinion as to the extent to which criminality is due to mental defectiveness. According to some workers the majority of criminals are mentally defective, and figures as high as 85 per cent. have been recorded in America. The English figures tend to be much more conservative but even in England the proportion has been put as high as 25 per cent. Goring was of the opinion that between 10 per cent. and 20 per cent. of criminals were mentally defective, Grace Pailthorpe found the proportion of mentally defective female prisoners was as high as 15 per cent., and Tredgold is of the opinion that the proportion of criminals who are mentally defective is probably not much less than 10 per cent. On the other hand, most prison psychiatrists hold a different opinion, and I must confess that when I worked in the prisons I did not ascertain or certify as mentally defective anything approaching 10 per cent. of the prison population. Even in convict prisons, which contain most of the inefficient and unsuccessful recidivists who have failed to profit by experience, there are few who could be regarded as certifiably mentally defective. I worked in the convict community of Dartmoor from 1936–39, and my senior colleague, Dr. Landers, conducted a psychological investigation of 200 unselected convicts. He did not find one frank mental defective, although 8·5 per cent. were of subnormal intelligence. Other workers have found comparable results. Grierson and Rixton found that the average mental age of 200 unselected male prisoners was 14 years. They also found a significant difference in the average mental age of the different crime-groups. The average mental age was highest in the case of acquisitive offences (in the case of fraud, false pretences and forgery it was 15 $\frac{2}{12}$ years), and lowest in the case of sexual crimes (12 $\frac{4}{12}$ years).

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Official statistics also do not support the view that criminality is frequently associated with mental defect. Thus in 1936 the number of persons found guilty of criminal offences and dealt with as mentally defective was 367, according to the Annual Report of the Board of Control. In the same year the total number of persons found guilty of indictable offences was 72,785 (Criminal Statistics), and the number found guilty of offences of all kinds, including motoring offences, was 824,951. In 1936 the number of persons received into prisons was 47,069, and of these only 228, or 0·48 per cent., were dealt with under the Mental Deficiency Acts. This proportion remains fairly constant, and the corresponding figure for 1947 was 0·64 per cent. There is no doubt that these official figures tend to under-estimate the proportion of criminals who are mentally defective. In the first place many mentally defective criminals are not ascertained. In the case of those who have been remanded or committed to one of the larger prisons with a full-time medical staff I do not think the proportion is very large, but in the case of small local prisons the position is different, and from the psychiatric standpoint they may be compared with small mental deficiency institutions which have no full-time or even visiting psychiatrist. The great majority of delinquents, however, are not sent to prison, and in these cases the ascertainment depends upon the Local Authorities, whose diligence in ascertaining mental defectives has, in the past, largely depended upon the amount of money they were prepared to spend in providing accommodation for them. Now that the responsibility for the institutional care of mental defectives has been transferred to the State, we may expect an increased awareness of their mental health responsibilities by certain Local Health Authorities. Another factor which tends to invalidate official figures is that not all mental defectives who are known to have committed crimes are dealt with as persons found guilty of a criminal offence ; not infrequently they are dealt with as persons who have been notified by the Local Education Authority or found neglected, so that their delinquency does not receive official recognition. On the other hand, there are factors which tend towards an over-estimation of the proportion of criminals who are mentally defective. If the oligophrenic is more liable to commit crime than a normal person he is certainly much more likely to be caught. A very large amount of crime, especially acquisitive crime, is never detected, as is shown by the enormous losses through theft from the large stores, railways, etc., and the relatively trivial amounts recovered. The oligophrenic is not usually a successful criminal, and it is very rarely that he can ask the judge to take 40 or 50 other offences into consideration—an achievement by no means impossible to the professional criminal. The fact is that we do not know the size of the criminal population but, as with mental defectives, we only know how many have been ascertained, and therefore any estimate as to the proportion of criminals who are mentally defective must be largely conjectural. But a very comprehensive and detailed medico-sociological study of 4,000 male adolescent delinquents was conducted at Wormwood Scrubs Prison between 1930 and 1937, and of these 4,000 lads about 3·5 per cent. were considered to be certifiable under the Mental Deficiency Acts. The adolescent period is the age at which we should expect to find the greatest number of non-ascertained mental defectives among the delinquent population, for the older the criminal and the more offences he has committed, the less likely is he to have escaped the diagnostic net. Therefore if we accept the results of this investigation at Wormwood Scrubs Prison, which is probably the most reliable and systematic study of adolescent delinquency undertaken in this country, we should conclude that the proportion of criminals who are certifiably mentally defective is less than 3·5 per cent.

Types of Delinquency.

There is no satisfactory psychological or psychiatric classification of crimes, and only in a very few and relatively uncommon forms of delinquency can we say that it is probably associated with a particular form of mental abnormality. Thus criminal libel is, in my experience, almost always associated with a paranoid state, and bestiality is usually, but not invariably, the crime of an oligophrenic or a dement. With few exceptions the legal or technical nature of the crime tells us little of the psychology of the delinquent who committed it, and crimes which have very similar results may have widely different motives at the root of them.

For practical purposes serious delinquency in adults can be divided into three main types: (*a*) crimes of violence, (*b*) crimes of sex, and (*c*) acquisitive crimes. There are, of course, several types of crime which cannot be included in these three groupings, such as criminal libel, perjury and treason, but they are comparative rarities. About 90 per cent. of indictable crimes in this country are of an acquisitive nature, about 3 per cent. are sexual offences, and about 3 per cent. are offences of violence against the person.

The first noteworthy feature of delinquency in mental defectives is that whereas sexual offences constitute only about 3 per cent. of the total volume of indictable crime in this country, about 25 per cent. of the crimes committed by oligophrenics are of a sexual nature. In the triennial period 1934–36 more than 26 per cent. of the offences committed by mental defectives were sexual offences, according to the Annual Report of the Board of Control for the year 1936. These figures agree closely with some earlier figures of East, who found that in a series of 283 mental defectives examined by him, 64, or 22·6 per cent., were charged with sexual offences. Thus we may say that sexual offences are nearly ten times as common in delinquent defectives as in ordinary criminals.

Crimes of violence are also more commonly committed by delinquent oligophrenics than by other offenders. Thus in East's series of 283 cases, 22 committed crimes of violence, and, excluding 3 cases of cruelty to animals and 2 cases of attempted suicide, the proportion of crimes of violence in his series was 6 per cent., whereas the proportion of criminals who are found guilty of indictable crimes of violence against the person is rather less than 3 per cent. Thus offences of violence appear to be two or three times more common in defective than non-defective criminals.

A State institution is the official home for a dangerously delinquent mental defective until such time as he loses his violent or dangerous propensities. Not all delinquency merits the honour of being officially regarded as violent or dangerous, and it is probably rather more difficult for an ambitious oligophrenic to get into Rampton or Moss Side than it is for him to get out. The popularity of the State institutions among certain mental defectives is well known, and it would perhaps be more fitting if their pleasant confines were reserved as a reward for the virtuous rather than as a terror for the ungodly. Medical superintendents would not then be confronted with such a problem as recently beset me when a hitherto docile oligophrenic, after a discussion with an ex-Rampton patient, threatened to smash unless she were sent there. The present arrangement has one advantage, however, for when an ex-State-institution patient absconds from a colony he quite often walks straight back to Rampton or Moss Side and so can be apprehended without difficulty.

The State institutions being reserved for dangerous or violent oligophrenics, it is to be expected that conduct disorders of an aggresssive or sexual type would be shown by a considerable proportion of their patients. For the purpose of this paper I examined my notes of patients I had specially observed at Rampton, and whose records I had thought worth preserving. These cases were unselected, except that some of them were specially examined because the question of transfer to a certified institution was under consideration. My notes therefore tend to relate more to the improved patients at Rampton than to the unimproved, and to give, on the whole, a rather optimistic picture of that community.

I examined my notes on 200 adult male patients,and found that the average age of these patients on admission to Rampton, i.e. when they first became officially regarded as dangerous or violent, was 23·7 years. The average mental age of these patients when recorded by me, which was in the majority of cases, was 9.46 years. I also tried to analyse the types of delinquency shown by these patients before and during institution treatment, with the following results: Before being sent to an institution, 111, or 55 per cent., of these men had a history of acquisitive delinquency, 29 per cent. had a history of violence and 32 per cent. had a record of sexual delinquency. During institutional training 12 per cent. had shown noteworthy acquisitive tendencies, 62 per cent. had been violent, and 35 per cent. had shown sexual uncontrol, either homosexual or heterosexual.

I also examined my notes on 80 adult female patients, and regret that I could not conscientiously bring the number up to a round hundred. The average age of these female patients on admission to Rampton was 24·2 years, and the average mental age, when recorded by me, was 9·42 years. Before receiving colony training 37 per cent. of them had a history of acquisitive offences, 33 per cent. had a record of violence, and 52 per cent. had a history of sexual delinquency. During institutional treatment 3 per cent. showed noteworthy acquisitive tendencies, 88 per cent. had been violent, and 37 per cent. showed sexual uncontrol.

THE VIOLENT MENTAL DEFECTIVE.

Murder may be regarded as the prototype of crimes of violence, and, following the importuning of Adam by Eve, is the second oldest crime in history. Although violence is common in delinquent oligophrenics, it very rarely proceeds to murder. During a period of little more than a year at Brixton Prison I saw between 60 and 70 remand cases of murder, and among them there was not one mental defective. Among the 1,200 or so patients at Rampton there was only a handful of murderers, and among 300 consecutive homicides admitted to Broadmoor only 16 were classified as suffering from primary oligophrenia.

Among 65 consecutive male admissions to Broadmoor which I examined in the years 1934–36 there were 4 mental defectives, of whom 2 had committed murder, the other 2 being sexual offenders. Of the two homicidal oligophrenics, one was an imbecile youth of 22 years who murdered a boy aged 3 years. He had always been regarded as harmless and inoffensive, and showed no vicious tendencies during the two years he was under my observation. No motive for the crime was ever discovered, and the case illustrates the danger of an apparently harmless imbecile being capable of a sudden act of homicidal violence. The other homicidal oligophrenic was a feeble-minded youth of 20 who murdered a boy aged 4 years by cutting off his penis, injuring the tissues of the axilla and rectum with a pair of scissors and then throwing the child into a canal. Later he voluntarily joined a search party, and returned with the small body of his victim on the handle-bars of his bicycle. He at first maintained his innocence and told an incredible story to account for his actions, but later confessed to the crime. At a medical examination he said that he had experienced a seminal emission whilst killing the child, a statement which was supported by an examination of his clothing. The past psychosexual history of this patient was interesting. He remembered that at about the age of 4 years he had had an erection of the penis and a sexual sensation whilst being bathed by an aunt, who told him that if it occurred again his penis would have to be cut off with scissors. Subsequently he had experienced sexual excitement at the thought of cutting with scissors and other forms of cruelty, and all his sex dreams and masturbation phantasies had been about such subjects. In one of his sex dreams he saw a girl being beaten by a man, and his first orgasm occurred while watching two men fighting in the street. He appeared never to have had any normal heterosexual experiences, dreams or phantasies. This case is of interest in that it shows how sadism in a mental defective may be related to, and conditioned by an early sexual incident.

Among the 200 male Rampton patients there was only one murderer, although 9 patients had been charged with attempted murder or wounding. This patient had killed a woman and mutilated her genitalia only a few months after he had been imprisoned for torturing animals. Sadism is not uncommon in delinquent oligophrenics, and I think it is probable that some of the apparently motiveless murders committed by mental defectives are sadistic in origin.

The sadistic motive was apparent in some of the lesser crimes of violence committed by these male patients, and 9 had a history of cruelty to children or to animals or to both. Moreover 7 of them had a history of violence to children or females together with a history of sexual offences, suggesting that what were legally classified as crimes of simple violence may have been committed for motives of sexual pleasure.

Twelve of the male patients who showed violence before institutional treatment were chronic encephalitics and 2 were epileptics. In 4 cases the history strongly suggested a co-existent psychotic or pre-psychotic state as being the determining factor of a crime of violence, and in 2 of the cases of attempted murder the crimes appeared to have been committed during an adolescent illness of schizophrenic reaction type. Six cases were of the psychopathic "social rebel" type in which the violence appeared to be part of a blind hostility to society, and in most of these cases there was something in the history to suggest that the patient had been brought up in a hostile or otherwise adverse environment. Three of the patients were low-grade oligophrenics in whom the violence appeared to be due to faulty conditioning by an unsympathetic environment. In 3 cases the violence appeared to be due to alcohol, and in another 3 cases the patients had shown violence only when trying to avoid arrest. In the remaining cases the history was not sufficient to give a reliable clue to the cause of the violent conduct before admission to an institution.

Of the 80 female patients, 27, or 33 per cent., had a history of violence to the person before admission to a colony. In one case, that of a feeble-minded girl charged with causing grievous bodily harm to her mother with an axe, the history and subsequent progress suggested that the crime was committed during an adolescent schizophrenic illness. In 2 cases charged with cruelty to children, one patient having three convictions for this offence, a sadistic motive appeared probable. Two of the patients were chronic encephalitics, and one was an epileptic. But the largest group of female patients showing pre-institutional violence were the psychopathic "social rebels." Twelve of these 27 violent patients appeared to me to be of this type, and in most of these cases there was evidence that the patient had been brought up in a strongly adverse environment. Social rebels are of course by no means confined to mental defectives, and I believe that a state of psychopathic social rebellion can be conditioned in normal persons if the early environment is sufficiently bad, and especially if it is cruel and hostile. In the case of mental defectives this faulty conditioning is much more likely to occur first, because his personality is more vulnerable to environmental influences, and secondly, because in a bad household the higher-grade oligophrenic often bears the brunt of parental aggressiveness, while the more intelligent siblings escape. The sister of one such patient at Rampton, an intelligent married woman, gave me an account of her early experiences at the hands of an unstable, drunken and violent father, and had no doubt that this was the cause of her mentally defective sister's conduct disorders. She said," If I had been dull-witted like my sister I should have reacted in the same way. I had just enough sense to survive it." In the case of another such patient, a girl of 18 with a mental age of 9 years who had a history of gross violence both before and after admission to an institution, it was recorded in the notes that she ran down the street screaming whenever her father arrived home drunk. It was noted that in institutions her outbursts of violence occurred only after she had witnessed an act of violence by another patient. It requires little imagination to understand the mechanism of this type of conduct. At some stage in her life she would have outbursts of hysterical violence when illtreated by her drunken father, and discover that this had a salutary effect on the drunken bully. Violence became her conditioned response to violence, whether or not it was directed against herself ; it was a panic fear-reaction with self-preservation as the motive.

The most aggressively violent patient I can recollect at Rampton was a high-grade feeble-minded girl with a history of common assault prior to admission. At Rampton she showed almost every kind of aggressive conduct disorder, including roof-wrecking, window smashing, and violent attacks on the staff. She also showed compulsive masturbation and self-mutilation, using implements which she secreted for this purpose, and by means of which she caused serious loss of blood. The history of this girl, as given to me by the mother, was that she was the second of two illegitimate children. The mother was too poor to support her, and for a few years she was brought up by her grandparents. They died during her childhood and she was then sent to an orphanage. When she was 12 or 13 the mother married a man over 60 years of age, and, being then able to support this girl, took her home from the orphanage. Shortly afterwards she discovered blood on the girl's underclothes and at first thought it was due to menstruation until her other daughter, who was a year or two older, told her mother that the step-father had been interfering with them sexually. With such a history—illegitimacy, upbringing by grandparents, followed by an orphanage, and sexual trauma at puberty—it is not difficult to understand why a high-grade mental defective develops into an extreme social rebel addicted to sexual self-mutilation.

All the other psychological conditioning factors of social rebellion can be found in the case-histories at Rampton—broken homes, criminality in the parents, foster-parentage, etc. One feeble-minded girl of this type had been admitted to Rampton at the age of 16 with a history of violence and sexual delinquency. She was illegitimate,and had been adopted at the age of 8 years, and developed an intense antipathy to her adoptive mother which culminated in causing serious injury by throwing ammonia at her. The adoptive parent appeared to be a good foster-mother with a genuine affection for her adopted daughter, and there was no question of any deliberate ill-treatment. The essential fact in the psychology of the adopted child who shows social rebellion appears to be an intense feeling of inferiority because she has been disowned by her own parents, and a compensatory paranoid reaction towards the adoptive parent, whom she comes to regard as having stolen her from her natural mother.

To sum up so far, I believe that excluding post-encephalitics, epileptics and oligophrenics showing psychotic reactions, faulty psychological conditioning acting upon the soil of limited intelligence is a major factor in the production of violent high-grade mental defectives, and even in the organic and psychotic types the influence of the environment is by no means negligible.

So far I have been speaking mainly of violence exhibited by patients before admission to a colony, but one of the striking features of this series is the number of patients who first showed violence during institutional training. Of the 200 male patients, 29 per cent. had a record of violence, other than sexual violence, before admission to an institution, and 62 per cent. showed violence during their colony training. In the case of the 80 female patients the difference was even greater, the figures being 33 per cent. and 88 per cent. respectively. The figures concerning institutional violence relate, of course, to other institutions in addition to Rampton, many patients having been sent to the State institution because of violence in other colonies. These figures suggest that institutional training or segregation is itself liable to cause violent reactions, especially in the case of high-grade patients to which they chiefly relate, and they also suggest that the high-grade female is less tolerant of colony segregation than is the male.

The violent reactions of the female patients at Rampton may take the form of violence to others, violence to property, such as roof-wrecking, window-smashing, destruction of bedding and clothing, attempted incendiarism, etc., and violence to self, including major or minor self-mutilation, swallowing foreign bodies, and feigned or very rarely genuine attempts at suicide. If we exclude the encephalitics, the epileptics and the borderline psychotic patients, I think the violent reactions of high-grade female patients during segregation can be largely attributed to three closely related causes, (*a*) sexual frustration, (*b*) feelings of inferiority, and (*c*) desire for affection.

Sexual frustration is a common cause of institutional violence. In the case of the higher-grade male patients it is likely to be direct reaction to thwarted physical desires, and violent quarrels may arise from homosexual or heterosexual jealousy, or violence may be used to intimidate an unwilling homosexual partner. Violence due to sexual frustration is not very common among male patients, even at Rampton, although when it occurs it may take a serious form. Sexual frustration appears to play a much bigger part in the violent reactions of segregated high-grade female patients, although, unlike the male patients, such violence is not usually due solely to thwarted physical impulses. The high-grade feeble-minded young woman who is admitted to an institution is frustrated not merely as regards her physical urges, but also in respect of the maternal and home-making instincts and all the instinctual desires which go to make up the complicated sexual life of the female. She knows that her sexual life is short, and that each year of segregation lessens her chances of ever having a home and family of her own. She also knows that bearing and caring for children is one of the few jobs she could do, however badly. She has enough intelligence to compare her plight with that of other women, but not enough to adopt any of the sublimations open to women of higher intelligence, and in these circumstances it is not surprising that resentment against her fate sometimes finds expression in a blind frenzy of violence directed occasionally against the staff,but more often against the very walls and buildings that enclose her.

I may add that women of normal intelligence show a much greater intolerance to captivity than do men. Minor aggressiveness and violence is a usual feature of women's prisons, in marked contrast with the quiet orderliness of prisons for men, although in the latter case the peacefulness is apt to be deceptive, and to be interrupted by occasional but serious outbreaks of individual or mass violence of a much more dangerous kind than occurs among female prisoners. The type of reaction of female prisoners to imprisonment appears to depend upon the educational and intellectual level of the women—noisy and aggressive hysterical reactions are common in those of low intellectual and educational attainments, whereas intelligent and educated women show quieter psychoneurotic reactions. During the war there were interned in Holloway Prison, under the various Defence Regulations, a number of women of high intellectual endowments, and I noted that several of them showed an anxiety state of which the main symptom was fear of sexual disease. This "pelvic neurosis," as it might be called, appeared to be due to fears that indefinite segregation would deprive them of opportunities of sexual fulfilment. Perhaps the most unhappy women were the wives who had been imprisoned and whose husbands had not, for their anxiety was increased by doubts as to what their husbands were doing in their absence. Their unhappiness contrasted with the poise and self-assurance of those wives whose husbands had also been interned.

Feelings of inferiority also play their part in causing violent reactions in segregated high-grade patients. Unlike the medium-grade mental defective, who is usually very happy and contented in a colony, the high-grade patient has sufficient intelligence to appreciate her shortcomings, and to compare herself with members of the staff and others of normal intelligence. It is therefore not surprising that she is liable to acquire a strong feeling of inferiority, and a corresponding desire for spectacular achievement. The easiest way for her to gain notoriety and the undivided attention of the staff, for which she craves, is by some outstanding act of destruction, such as roof-wrecking or window smashing on the grand scale, and this over-compensatory desire for achievement was, I think, responsible for the occasional major acts of destructiveness at Rampton. The competitive element was well shown by the patients who indulged in these destructive orgies, and one soon learned by experience that if Elizabeth was in the limelight for some outstanding act of destruction, then Esme must be watched very carefully for a time, for she would certainly take the first opportunity of beating her rival.

I am speaking, of course, of the days before leucotomy produced its tranquillizing effect upon Rampton. Now I understand it is pervaded by a cloistral calm, which is disturbed only by the sound of the surgeon's trephine. But even before the advent of leucotomy acts of major destructiveness were uncommon. Some of the older members of the staff, however, could tell hair-raising stories of the days before occupational therapy became a scientific and highly-organized form of treatment, and this form of therapy is indeed the logical solution to the high-grade patient's desire for achievement.

Desire for affection is also not uncommonly a cause of acts of violence by high-grade female patients in colonies. It is perhaps almost indistinguishable from sexual frustration, but it operates, I think, especially in those patients who have never experienced normal parental affection, having spent all or most of their lives in orphanages, homes or institutions of one kind or another. They desire to become the beloved object of some member of the staff, who serves as a mother substitute, but are frustrated by institution etiquette and have to suppress their feelings. These suppressed feelings may then, through the mechanism of inversion, find expression in the form of verbal or physical assaults upon the object of their affection.

THE SEXUALLY DELINQUENT MENTAL DEFECTIVE.

Although the total volume of crime committed by mental defectives is relatively small, the delinquent oligophrenic is potentially more dangerous to society than the non-defective criminal because he is much more likely to commit sexual crime. Not only is he nearly ten times more likely to commit sexual offences than the ordinary criminal, but the graver the sexual crime the more likely is it to be associated with mental abnormality, and especially with mental defectiveness. Offences such as rape and carnal knowledge of children are more often associated with oligophrenia than are lesser offences, such as indecent assault and indecent exposure.

Of the 200 male Rampton patients, 65, or 32 per cent., had a history of sexual delinquency prior to admission to an institution, and 54, or 27 per cent., had been convicted or charged with sexual offences. Of the 80 female patients, 42, or 52 per cent., had a history of sexual uncontrol prior to colony treatment. But although these figures suggest that sexual uncontrol is more common in the high-grade female patient than in the male, the male sexually delinquent oligophrenic constitutes a more obvious and immediate social danger, because his sexual uncontrol is often associated with physical or psychological trauma to his victim or is directed against children, whereas the danger of the sexually uncontrolled female mental defective lies in her propensity for spreading disease, producing dysgenic offspring, and teaching others the habits of immorality.

All types of sexual offences were to be found in the records of the 54 male patients, including bestiality, buggery, attempted rape, carnal knowledge, indecent assault of males or females, indecent exposure, gross indecency with males, incest, and even abduction and bigamy. Of these 54 male sexual delinquents, 27, or 50 per cent., had a known record of more than one sexual offence, 14 having a history of more than one offence of the same kind, and 13 having a record of more than one kind of sexual crime. These figures bear little relation to reality, however, because in the case of relatively minor sexual offences such as indecent exposure an enormous number may be committed before the subject is caught. In the case of indecent exposure it so frequently happens that a very large number of offences has been committed before an arrest is made, that when examining persons remanded to prison for this offence I usually asked them how many hundred times they had done it, and when put in this form the answers were sometimes surprising. One man charged with this offence, ostensibly his first lapse, told me that he had exposed himself about 200 times in Hyde Park during his midday lunch hours before he was caught. Another patient, a high-grade mental defective at Rampton, answered promptly, "About 400 or 500 times," and when asked how he was so sure of the number he said that he had done it about twice a week for four or five years before he was arrested. To a lesser extent this is also true of minor acts of indecent assault. I recollect one borderline mental defective whom I examined at Brixton Prison following such a charge. He had been sitting next to a woman in a cinema in Whitechapel and had taken certain manual liberties which had led to vociferous indignation on her part. When I pointed out that such conduct was not only reprehensible but also extremely stupid because no lady would tolerate such conduct, especially from a complete stranger he replied that he had done the same thing to seven other ladies in the same cinema and none had objected.

In the case of more serious sexual offences police action and ascertainment is likely to occur much earlier than in the case of minor offences. Nevertheless, some mental defectives achieve a spectacular record of major sex crimes before they are ascertained. Perhaps the most terrible record I have known is that of a high-grade mental defective who was admitted to Rampton at the age of 55 years. His record was as follows: 1908, indecent assault, females, 1 year's imprisonment; 1908, rape, 7 years' penal servitude; 1914, indecent assault, 3 months' hard labour and licence revoked; 1918, indecent exposure and indecent assault, 3 and 6 months' hard labour; 1920, procuring male to commit gross indecency, 21 months' hard labour; 1922, indecent exposure, 3 months' hard labour; 1922, bigamy, 12 months' hard labour; 1924, indecent assault of female aged 7 years, 6 months' hard labour; 1925, indecent assault female under 16 years, 6 months' hard labour; 1925, indecent assault female aged 7 years, 3 months' hard labour; 1926, abduction, sent to a mental deficiency institution as a place of safety and absconded; 1930, indecent assault, 2 months' hard labour.

The high-grade sexually delinquent oligophrenic will probably always be a potential danger to society. Once a mental defective has committed a serious sexual crime,it is extremely difficult to know when it is reasonably safe to allow him a measure of liberty. Only after prolonged and careful observation in a colony can one feel justified in recommending a trial in society, and even then there will be failures. In the Rampton cases one man raped a girl of 13 twenty years after having been convicted of assaulting a female, and another patient was charged with buggery and indecent assault with violence 22 years after he had indecently assaulted a child of 4 years, both patients having no known history of sexual uncontrol in the intervening periods. The fact is that unless one is prepared to segregate such patients for life, one must take a chance after a period of careful observation of their conduct and of their reactions to the mild erotic stimulation which they obtain from dances, the cinema and other entertainments under colony conditions. Two points occur to me, however, that may be useful in assessing the dangerousness of the sexually delinquent mental defective. First, oligophrenics who are addicted to indecent exposure rarely commit serious sexual crimes, though they may commit minor acts of indecent assault. It is probably safer to release a patient who has a history of several hundred indecent exposures than to allow freedom to one who has committed a single serious sexual crime. Secondly, that the legal offence of indecent assault covers a very wide range of sexual offences, some being relatively trivial while others may be very serious. Thus of two Rampton patients who had both been charged with three cases of indecent assault, one had committed three separate assaults on children, in each of which a child was seriously injured. They were really attempts at rape, the charges probably having been reduced so that the patient could be dealt with summarily. The other patient had been so stimulated by an amorous scene at the cinema that he had touched the knees of three young ladies sitting on the row behind him, and he also was found guilty of three cases of indecent assault. The first patient was a menace to society, the second was little more than unconventional, but on paper they appeared to be equally dangerous.

The offences committed by the sexually delinquent males were as follows:

Bestiality (2 cases).

Bestiality is a rare offence and is almost always associated with oligophrenia or dementia, although I have known intellectually normal persons of a crude type to be charged with this offence, usually when under the influence of drink. Typical of the ament who commits bestiality was a patient whom I saw on admission to Broadmoor, and who had been found insane on arraignment on a charge of attempted buggery with a cow. He was a clumsy, coarse-featured, feeble-minded man aged 37, with a mental age of 9 years, who worked as a labourer. He denied the offence with which he was charged and said he was merely looking at the cow, but according to the police report the attempt was made in an open field in daylight without any effort at concealment, and was stopped by a police constable. After admission to Broadmoor the patient made several rather naïve requests to be given work on the farm. Two of the Rampton patients in this series had a history of bestiality, one with a donkey and one with two cows, their mental ages being 6 and 8 years respectively. Most domestic and farmyard animals figure in the records of Broadmoor and Rampton, and I think a gross lack of aesthetic appreciation can be assumed in anyone who commits this curious offence, whether or not they are mentally defective.

Attempted Rape and Carnal Knowledge.

Four of the Rampton patients had been charged with attempted rape, and five with carnal knowledge. Two of the patients had attempted to rape elderly women, one of the victims being 73 years of age. The patient who committed this offence had also committed robbery with violence on his victim. He was a simple and apparently harmless, feeble-minded man with a mental age of 8 years. He was a serving soldier with a good army record, and at the time of the crime had been drinking heavily. The cases of carnal knowledge all concerned children, the youngest victim being a child of four years, except for one low-grade feeble-minded man who was charged with carnal knowledge of a female imbecile. Apparently the law assumes that a male mental defective can recognize a female oligophrenic, and a low-grade male patient who was seduced by a high-grade female would, in theory, be in danger of undergoing two years' imprisonment.

Indecent Assault.

Thirty-two patients had been charged with this, the most common form of sexual offence. In six cases the victims were males, in 19 cases they were females, and in the remaining 7 cases the sex of the victims was not specified. As I have already said, the term indecent assault may mean anything from an attempted rape to what is little more than an obscene gesture.

Indecent Exposure.

There were 13 patients who had committed this offence, which is not uncommonly associated with mental defect. It is a common sexual offence, and during a period of little more than a year at Brixton Prison I saw 65 cases out of a total of 221 sexual offenders, and of the 65 persons charged with this offence, 9, or 14 per cent., were mentally defective. It is a most interesting condition from the psychiatric standpoint, for it may be associated with almost any form of mental abnormality. Occasionally it may be due to mental defect alone, as in the case of a low-grade oligophrenic who masturbates in public. Such cases rarely come before the Court, but I did see one speechless idiot who had been charged with this offence and remanded to prison for a medical examination and report. Even when mental defect is present, there is also a neurotic basis for the exhibitionism, and not uncommonly it can be traced to an organic inferiority feeling. The feeble-minded Rampton patient who admitted to between 400 and 500 cases of indecent exposure was a fairly typical example of this. He was a weedy, undersized youth of uncomely appearance with a severe myopia who told me that all his advances towards females had met with rebuff or ridicule. By means of indecent exposure he could make sexual advances without fear of being laughed at, and eventually it became his sole means of sexual gratification. Another man whom I saw during a remand to prison, who was not a mental defective although he was of subnormal intelligence, had become completely hairless at the age of 20. He developed such a morbid fear of ridicule by the opposite sex on account of his baldness that he spent all his non-working hours in the basement kitchen of his house, where he could gaze at passing females without being seen by them, and from which he emerged at infrequent intervals in order to commit indecent exposure. This type of mental mechanism, with its various modifications, is in my experience quite often associated with indecent exposure, which, like other forms of exhibitionism, may represent an over-compensatory reaction to a strong feeling of inferiority.

In the case of female oligophrenics, indecent exposure rarely presents any psychological subtleties and is usually a crude form of sexual invitation. I do not think there is any specific legal offence of indecent exposure in the case of females, although such cases are occasionally received into prisons on a charge of indecent behaviour. Typical of the female exhibitionistic oligophrenic was a pert little high-grade girl of 15 whom I saw in Holloway Prison, and who later graduated to Rampton. It was her custom to expose herself from some bushes on Hampstead Heath, and invite passing soldiers to join her for a fee of half-a-crown. She was a borderline mental defective, and I had a long, fatherly talk with her and finally asked her if she realized how stupid she had been. She replied, instantly, "Oh yes, doctor, I should have gone to Hyde Park. I should have made a lot more money there."

Also included in the sexual offences committed by the 54 male Rampton patients were five cases of buggery, two cases of gross indecency with males, and two cases of incest, in both cases with the sister.

In the case of the 42 female patients with a history of sexual uncontrol prior to admission to a colony, their records usually consisted of ordinary promiscuity. Thirteen of them had had one or more illegitimate children, and twelve were known to have suffered from venereal disease. Two had a history of indecent exposure, both being high-grade feeble-minded patients.

Only one patient had been charged with an offence of prostitution, and it would appear that mental defectives rarely achieve professional status as prostitutes. In the triennial period 1934–36, out of 1,102 offences committed by mental defectives, only four were offences of prostitution, and among the prostitutes I saw during a period of rather more than a year at Holloway Prison none appeared to me to be certifiably mentally defective, although some were of subnormal intelligence. I cannot say that I studied these patients carefully, however, partly through pressure of other work and partly from a certain diffidence at appearing to spend too much time with them. They were amiable people who could be relied upon to give one a friendly personal greeting if ever one saw them by chance in the West End, and one old lady, who had been superannuated to a post as flower-seller in Piccadilly, always had a very cheery salutation for any doctor from Holloway.

The proportion of Rampton patients who showed noteworthy signs of sexual uncontrol within institutions did not greatly differ from the proportion who showed such signs before admission to a colony. Seventy-one, or 35 per cent. of the male patients, and 30, or 37 per cent. of the female patients in this series showed such traits during colony segregation. This is what one would expect, for sexual impulses do not disappear when a patient enters a colony. But the patients who showed sexual uncontrol within institutions were not always, or usually, those who had committed sexual offences prior to admission. Of the 65 male patients with a bad sexual history before admission to a colony, only 24 showed noteworthy sexual tendencies within an institution, and of 42 female patients who were sexually uncontrolled before receiving colony treatment, only 15 showed signs of sexual promiscuity during their training. While no great accuracy can be claimed for these figures, they at least illustrate how difficult it is to assess the progress made by patients with a history of sexual delinquency, for such patients show no greater tendency to promiscuity within a colony than do delinquent mental defectives with no such previous record.

Of the 71 male Rampton patients of this series who showed noteworthy sexual uncontrol during colony training, 55 were predominantly homosexual, 11 were heterosexual, and 5 showed mixed trends. Of the 30 female patients who offended against sexual conventions in institutions, 5 were predominantly homosexual, 21 were heterosexual, and 4 showed mixed tendencies. These figures suggest that the segregated male delinquent mental defective is predominantly homosexual, while the segregated female patient remains predominantly heterosexual, but I do not think that any reliance can be placed upon them because so much depends upon the question of opportunity. The majority of the male patients at Rampton see little of the female patients except at dances and other supervised social functions, whereas the female patients frequently see small selected groups of male patients who do the rough gardening and heavy work in the grounds, and they also see the male employees of the institution. If the experiment of sending female patients to work in the gardens of the male side of Rampton were to be tried, I have no doubt that there would be some increase of heterosexual manifestations and, very possibly, a decrease of homosexual tendencies among the male patients.

There is also the difference of conventions in the sexes. Minor displays of affection among female patients are so common that they are not regarded as unusual, and afford a harmless outlet for emotional tension, whereas similar manifestations among male patients would rightly be regarded with great suspicion. It would appear that whenever the sexes are segregated there tends to be a temporary deviation towards homosexuality, although the cruder manifestations of this are more common in the male. A high-grade male patient at Rampton once remarked that if a bench of bishops were stranded on a desert isle they would begin to show homosexual tendencies. While not accepting any implications of this remark, there is a grain of truth in it if confined to the psychological sphere. Unless there is evidence of sexual inversion before admission, homosexual misconduct within an institution should, I think, be regarded simply as evidence of sexual uncontrol rather than of sexual deviation, for it is unlikely to persist when heterosexual objects of affection are available. There is, however, a danger to be guarded against. Under colony conditions it is very easy for those in charge to appear to be more tolerant of homosexual misconduct than of heterosexual misbehaviour among patients, simply because the immediate practical consequences of the former may be less serious from an administrative standpoint. As patients undergoing training tend to adopt the moral code of their colony, it is essential that this code should be the same as that of the outside world into which they will be sent if their training is successful. It is better to take the risk of a heterosexual mishap than to risk inculcating a system of sexual morality that is at variance with the ethical code of present-day society.

The Acquisitive Mental Defective.

I propose to say very little about acquisitive delinquency in mental defectives because, although the majority of offences committed by olgophrenics are of this kind, they are of relatively little social importance. Not only is the number of acquisitive offences committed by mental defectives trivial in comparison with the great mass of acquisitive crime, but the thefts committed by oligophenics tend to be much less serious than those committed by more astute criminals. There are, of course, exceptions to this rule, and some high-grade oligophrenics can be very clever thieves, but in general the acquisitive achievements of delinquent mental defectives make a poor show in comparison with the records of quite humble members of the prison population. The highest number of known convictions among the male Rampton patients of this series was 13—a mediocre record for a professional thief. Only one patient was a moderately successful forger, a crime which, with false pretences and fraudulent conversion, may be regarded as the hall-mark of the high-class criminal. I am sure that the inmates of Dartmoor would despise the acquisitive efforts of the patients at Rampton, although they would be less critical of their records of violence and might admire their sexual prowess. Therefore, perhaps because I have subconsciously accepted Dartmoor standards, I am inclined to treat the acquisitive offences of mental defectives in a rather perfunctory manner.

In general I think we can say that the motives for the acquisitive conduct disorders of mental defectives are of a negative rather than of a positive kind, and are usually related in some way to their inability to compete with their normal fellows. Feelings of inferiority may play a part in the development of acquisitive habits, and I think that not a few high-grade patients commence stealing in childhood in order to buy popularity and increase their esteem among their more intelligent playmates and schoolfellows. In institutions delinquent mental defectives do not appear to me to possess anything like the active predatory tendencies that are shown by professional criminals in prison. I was at Dartmoor Prison when a modest scheme of payments to convicts was introduced, and it was very interesting to observe how, despite all possible official controls and restrictions on free enterprise except income tax, a capitalist order of society firmly based on the tobacco standard arose within a few weeks, and this in a community by no means free from communist influence. Profiteers arose almost overnight, moneylenders soon had many dupes in their clutches, and there were ugly signs of gang warfare. Although some of the Rampton patients pilfered and would take advantage of lower-grade patients if they got the chance, their acquisitiveness was of a different order from the greed and avarice shown by many of the more intelligent criminals in prison.

CONCLUSION.

In this paper I have confined myself to the three chief types of serious delinquency shown by adult mental defectives, namely acquisitive offences, sexual uncontrol and aggressive or violent conduct. I have largely ignored the part played by chronic encephalitis, epilepsy and organic disease in general in the aetiology of such delinquency, not because they are unimportant, but because they have been fully described elsewhere, and because these conditions were present in an unduly small number of cases in this series. In general, however, I believe that faulty conditioning by a bad psychological, social and domestic environment is a major cause of the development of anti-social reactions in mentally defective persons, and that in treating such cases we must have regard to the strong feelings of frustration and of inferiority which are often the key-notes to the psychology of the high-grade delinquent mental defective.

Acquisitive delinquency in mental defectives is of minor social importance, because the number of such offences committed by oligophrenics is very small compared with the total volume of acquisitive crime committed by other persons, and also because the predatory offences of mental defectives are usually of a minor kind. Sexual delinquency in male mental defectives is a much bigger social problem because the delinquent oligophrenic is not only much more likely to commit sexual offences than are other delinquents, but he is also liable to commit the graver types of sexual crime. The only answer to this problem, so far as I know, is by way of early ascertainment and prolonged colony training. Early ascertainment is important, because if not given proper care and training the sexually delinquent oligophrenic will almost certainly repeat his offence, and in a borderline case of mental defect I think that a history of a serious sex crime is sufficient additional evidence to justify certification under the Mental Deficiency

Acts. A senior colleague of many years' experience in the Prison Medical Service told me that whenever he had ignored this rule he had had cause to regret it. I do not think that measures such as sterilization or castration of sexually delinquent oligophrenics are justifiable because, apart from ethical considerations, they are two-edged weapons. These operations do not necessarily cause a decrease in sexual potency or desire, and there is some evidence that vasectomy may be followed by an increase of sexual activity. It must also be remembered that sexual potency may play no part in the gravest sexual crimes, such as sadistic murders and assaults, and sadistic urges are latent in not a few mental defectives. In the case of females, sterilization would affect only their reproductive functions, and might conceivably lead to an increase in their promiscuity and potentiality for spreading disease.

The fact that a considerable proportion of high-grade oligophrenics first show aggressive or violent reactions during colony training should lead to a little heart-searching on our part. We need not be unduly despondent or shame-faced, because such reactions may occur whenever and wherever human beings are compulsorily segregated, and we are dealing with very unstable material, but as psychiatrists we should like to feel that our hospitals had a better record than the various institutions under the control of the Home Office. I think the proportion of high-grade oligophrenics who develop aggressive reactions during colony training is higher than it need be for two main reasons. First, some of the small mental deficiency institutions are quite unsuitable for high-grade patients, and my impression when I worked in a State institution was that these small institutions contributed more than their proportionate quota of violent or dangerous patients. More than any other type of mental defective, the high-grade patient requires to be trained in a well-equipped colony with adequate facilities for occupational therapy, recreation and social training. In the past the distribution of patients to institutions largely depended upon Local Authority boundaries and considerations of ownership, and any scientific approach to the problem was wellnigh impossible. In the future, with proper organization, there will be no need for a few high-grade patients to lead a frustrated existence in unsuitable surroundings. Secondly, the high-grade delinquent mental defective often suffers from long delay in ascertainment and receiving proper treatment. Too often colony training is regarded as the last resort for these patients, whereas their need for early treatment is more urgent than in the case of many lower-grade patients. Under the Education Acts the assessment of mental deficiency under the age of 16 years appears to me to be becoming almost entirely dependent upon psychometry, with little regard to broader psychiatric considerations, which must give way to the almighty I.Q. I think there is a real need for psychiatrists with wide experience of the treatment of mental deficiency to have a bigger say in deciding when colony training is necessary for high-grade patients showing the first signs of social inadaptability or rebellion. I know of no real evidence that high-grade patients who have been stabilized by colony training are less capable of leading a normal life in society, or are less fitted for parenthood, than the many docile subnormals who, because of their docility and lack of sufficient initiative even to rebel, are not officially regarded as mentally defective. The aim should surely be to fit these high-grade patients for ordinary social life by the time they become adult, and in the case of female patients the time factor is of great importance. At present they often arrive at the colony too late, with a long record of social inadaptability and uncontrolled conduct, so that years of training are necessary to counteract fully developed antisocial habits. If they could receive colony training when they first show signs of delinquency and anti-social conduct, often during puberty and early adolescence, I think our results would be better, and there would be fewer frustrated social rebels in our colonies.

EDUCATIONAL TYPES OF MENTALLY DEFECTIVE CHILDREN.*

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In 1872 Wm. Ireland, of Scotland, attempted a classification of mental deficiency based on pathological conditions. His twelve groups were : Genetous, Microcephalic, Hydrocephalic, Eclampsic, Epileptic, Paralytic, Traumatic, Inflammatory, Sclerotic, Syphilitic, Cretinous and Deprivative.

To-day Tredgold uses the same terminology for the clinical varieties, but groups these, as regards pathogenesis, into primary and secondary. The primary group, he estimates, includes four-fifths of all defectives, of which 72 per cent. were diagnosed as simple mental defect, 5 per cent. as mongols, and 2 per cent. as other rare varieties. This germinal group of *imperfect* neuronic development is attributed to germ abnormality.

The secondary group of *arrested* neuronic development is subdivided by Tredgold into the traumatic, infective, degenerative and deprivative classes, and in total covers about one-fifth of all cases. This classification has become the standard one, having held the field during the 40 years from the first edition of his book in 1908.

Although this type of classification is helpful as regards the aetiology of mental defect and is necessary for the study of the incidence of defect in the community, it has some limitations. It tends to prejudge the cause in the " simple type " of mental defect and to make it seem that all cases that have no obvious clinical lesion are germinal in origin, when in fact extremely little is known as to the ultimate cause of the defect. Penrose (1933) in a series of 500 cases found that over 60 per cent. were unclassifiable either as primary or as secondary oligophrenics because the effects of environment and heredity were so very difficult to extricate from one another. He preferred to say that 91 per cent. of his cases were due in *some* measure to heredity, and 71 per cent. were due in *some* measure to environment. Recent research has shown the interaction between environment and genetic factors, and both " causes " are necessary in many cases for a tendency to become overt.

E. O. Lewis (1933), by introducing the term " sub-cultural " provided a valuable corrective to the then prevailing and too rigid view that all " simple " defectives were of defective stock and that by implication normal persons were of normal genetic stock. He emphasized that there is a wide range in all human attributes and that there is no sharp division between the normal and the abnormal. By thus leaving open the question of the cause of the oligophrenia, research into the environmental as well as the genetic factors is encouraged.

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* Read at a Meeting of the Mental Deficiency Section of the R.M.P.A., held on 24 February, 1949.

The classifications so far considered while dealing with the causes, whether known or alleged, of mental defect tell us nothing about its effects. The degree of defect varies widely in all the types whether primary or secondary, and there is as much or as little correlation between these different clinical types and the mentality of individual defectives as there is between the causes of railway accidents and the resulting casualties.

Some quantitative assessment of mentality was essential to deal with individual cases of mental defect. Idiots and imbeciles were early recognized as distinct types of serious mental defect, but it was not until the Elementary Education (Defective and Epileptic Children) Act of 1899 that the feebleminded group was defined and provided with education in special schools and classes.

Binet and Simon, by their great study in 1905 of normal and feebleminded children, emphasized the need for a scientific assessment of the degree of limitation of intelligence in each case if suitable educational facilities were to be provided. They introduced their tests for this purpose, but, with the many modifications these have received on all sides, distortions and misconceptions have crept in which have obscured their author's original aims.

Binet stressed that there were two types of mentally defective children—the feebleminded and the ill-balanced, and that the examination of the physician must be reinforced by that of the psychologist. As the dominant features in the lives of defectives are the senses, concrete perception and motor ability (we might add—as in all children) so in their education the workshop ought to become a more important place of instruction than the classroom. Again, Binet says, "every class, every school for defectives, ought to aim at rendering the pupils socially useful. It is not a question of enriching their minds, but of giving them the means of working for their living."

In the previous century the pioneers of education for defectives had started with high hopes of success with imbeciles and even idiots. Itard's attempted education in Paris of the savage caught in the woods of Aveyron in 1798 laid a firm foundation for the training of idiots and imbeciles, although he overrated the mental capacity of his original pupil. Séguin opened a school in Paris in 1841 and later took over Bicêtre for the purpose. Andrew Reed provided at Highgate the first English idiot asylum, which later developed into the Eastern Counties and Earlswood Institutions.

As a result of the work of Binet and Simon it was possible to select with greater precision the children suitable for special education. The lowest grades were still given elementary training up to their capacity, but it came to be realized that patience and perseverance would never make an idiot educable in the ordinary sense. Efforts were then concentrated on the higher grades, and the curriculum adjusted for each mental age group, instead of being a diluted version of the normal school curriculum.

At the same time greater attention was given to the separation of physical defectives from the mental. One of the unsatisfactory results of the clinical classifications mentioned at the beginning of this paper is that mental deficiency tends to be presented in physical guise and children with crippling lesions, epilepsy, blindness and deafness are diagnosed as mental rather than primarily physical defectives. Too often to-day do such children regress in the unsuitable environment of a mental deficiency institution, instead of benefitting from the appropriate school for the deaf, the crippled, etc. If due allowance is made for the physical incapacity, certification as mental defectives can be avoided in many such cases.

Reviewing the education of defectives as it is to-day it would seem that in the forty years which have elapsed since Binet and Simon stated their case some of the principles on which they put such emphasis have been forgotten. For example, a number of M.D. institutions still have no psychologist on the staff. Some occupation centres and special schools have become an end in themselves, a place where defectives adjust to being defectives, turning their backs on the ordinary world. When they leave the school at 16 the institution for defectives seems their appropriate refuge, and after decades of further institutionalization any hope of adjustment to normal life may seem remote. Nevertheless, it is surprising how many of these defectives can adjust to community life if given suitable training and supervision. To achieve Binet's aim of rendering the pupils socially useful, schools and institutions must preserve as much contact with normal life as is possible, and no child should drop lower down the scale than is essential for his maximum development. Occupation centres should therefore be training centres and as such should be included in the educational system.

Administrative expediency must not determine the child's fate. A shortage of places in a school for the deaf must not sway the diagnosis to " probably mentally defective." The level of ineducability will tend to fluctuate with the number of places available in schools for the E.S.N. The number of children who would benefit from attendance at occupation centres must be assessed on first principles and not in relation to the number of centres actually opened. If sufficient occupation centres were available, some children at present in institutions could return home and attend daily for training while remaining in contact with the community. Nor must the use to an understaffed institution of a defective's working capacity be considered when suitability for licence is the question to be decided. It is easy to be pessimistic and take the view that defectives will probably fail in the community and therefore it will save all concerned worry and bother if they stay where they are. If there is a reasonable doubt, it should be in favour of the defective. Contact with the community may help to develop a greater degree of normality, but segregation with defectives can only confirm the deficiency.

Dull and backward children should, therefore, be given every opportunity to adjust to a normal community and not be regarded as E.S.N. A satisfactory adjustment can be made in spite of a considerable degree of illiteracy, inability to calculate and other scholastic defects, provided that emotionally the child is stable and made to feel one with the community. The more the individual feels cut off from the community, the more likely is he to resort to antisocial behaviour. Classification as E.S.N. and relegation to a special school is a step which must not be taken lightly. Many border-line defectives considered for E.S.N. schools have emotional problems which are the cause of, or materially contribute to, their lack of progress at an ordinary school. Unless these are dealt with on child guidance lines before the diagnosis of educational subnormality is made the child will have an even greater difficulty in adjusting to the unnatural environment of the special school.

Special schools, properly run and in close contact with normal schools, are an essential feature of the educational system, but it must not be overlooked that the public have yet to be educated to appreciate their true function. Thoughtless comments and foolish jokes about going to the "silly" school have a most undesirable effect on the higher grade and more sensitive children attending such schools.

It must be realized that the range of ages and mental capacity in an E.S.N. school is considerable, and the limited number of classes available means that there is a wider scatter of mental ages in each group than is usually found in the normal class where chronological age correlates closely with mental age.

The important point is that a child who is emotionally disturbed and unable to benefit from an ordinary school may be either a child whose average intelligence is masked by emotional factors, usually arising in the home situation, or a child whose subnormal mental capacity makes the school situation too difficult for him and his emotional disturbance is secondary to his mental deficiency.

The first child, if labelled E.S.N., will feel acutely his degradation in the literal sense. His emotional problems, far from being solved, will be intensified by his segregation in a special school. He will then either use his relatively brighter intelligence to become more difficult and mischievous or if he is the introverted type he will nurse his grievance, resort to phantasy and appear incapable of performing many of the tests designed to estimate minor degrees of mental defect, and the diagnosis of mental deficiency will appear to be confirmed.

In other words, this child may adopt some of the behaviour patterns of mental defectives and it is not surprising if, having been diagnosed as E.S.N. (that is, mentally defective) and placed in a special environment, his subsequent behaviour and appearance become more and more defective. For it must be remembered that in a special school he is cut off from contact with his normal fellows, he is given less stimulating images and concepts than his actual mental capacity requires for full development and his whole way of life is abnormal.

The second child, that is the one whose emotional disturbance was secondary to his inability to cope with the normal school environment, will, on the other hand tend to improve in a special school. This child will feel a sense of relief in the simpler environment, he will no longer be a pigmy among giants, but will find that he is mentally as tall as his fellows. He will find outlets for his frustrations, gain a sense of achievement in the simpler tasks and skills, and as a result have a good chance of learning to live within his capacity in the community.

Although the diagnosis between these two types is difficult it must be made if we are to reduce the number of misfits in the school system. The defective whose social adjustment is good and whose mental defect is slight should stay within the normal school. The emotionally disturbed child who *appears* unable to benefit from normal school must be helped by the child guidance clinic to make a proper adjustment so that he *can* benefit, while the defective child whose emotional maladjustment is secondary must be liberated from the frustrating atmosphere of a school which is beyond his powers.

One of the practical difficulties in the proper classification and segregation of the E.S.N. is the gross shortage of suitable schools, teachers and equipment resulting in part from the disorganization of the war period. Evacuation closed down many special schools, and it has not yet been possible for local authorities to provide the number of places that are required. One effect of this is that the I.Q. expected of children in special schools has tended to rise. It is obvious that if a particular school has too many children on its books the less bright will be excluded, as the teachers want to show "results." Many people judge the results of special education by the orderliness of the class and the quality of the fancy handwork exhibited, but the individual child and his capacity to think and to act in a socially-adjusted way in the community is the only criterion of the success of the special education provided.

The child's development must be seen in perspective. His behaviour to-day may satisfy the teacher and he may, as a result of the static curriculum in the school, be stabilized or rather arrested at that stage. The true estimate of his progress is whether or not his general development is towards the ultimate goal of adjustment to society, however limited and circumscribed that adjustment may be in a particular case.

Binet reminds us of the special school where the children learnt to make artificial flowers. Some of the children when they grew up were able to obtain ordinary jobs in the community—but none of them earned their living by making artificial flowers.

While most schools now adjust their occupational curriculum to practical tasks that the defective could continue in the community, too many schools adopt an over-protective and inhibiting attitude towards the children of 12 to 16. This results in a child leaving the special school with possibly some knowledge of a trade, but very little common sense or knowledge of the world. Defectives are too often expected to be foolish and incapable of thought or reason, yet feeble-minded persons do develop their limited powers if given the opportunity. Adjustment to society does not come by precept but only by experience and the special school child has limited opportunities and little encouragement to obtain that experience.

Not only are the children with the lower range of feeble-minded I.Q.'s of 50–60 being excluded from Special School as ineducable, but brighter children, who do not fit in and who disturb the even tenor of the special school, are also regarded as ineducable and sent down to the occupation centre. Some of these children are emotionally disturbed and need psychological adjustment rather than relegation to a group of imbeciles. It is these children who are liable to become unstable defectives, moral defectives and psychopaths when they grow up. They will not benefit from the limited outlook and cramping curriculum of an occupation centre which is even less designed for their special needs than an E.S.N. school.

One of the reasons that occupation centres and special schools tend to have too pessimistic an attitude to their work and the possibilities in their pupils is that the staff more often hear of their failures than of their successes. A child leaves the school at 16 and may go into the world and fail to adjust. This will confirm the teachers in their view that children whose I.Q. is 50 to 70 cannot manage on their own. As a result the remaining pupils are treated with less confidence in their abilities and an even more sheltered and immature environment provided for them. If an adequate follow-up of cases were possible more children might be found who had made a satisfactory adjustment and a more progressive attitude might then be encouraged. A number of defectives leave special schools, and after a few years fail in the community and are certified and sent to adult institutions. They may spend ten or twenty years as institutionalized patients. If some of these are again tried in the community on licence it is sometimes surprising how well they can adjust. It is well known that young adult defectives are a difficult problem and that a slow maturation may account for their subsequent adjustment, but it is also possible that the training at the special school was at fault, and the transition from school to normal employment was too sudden and unprepared for. Facilities for greater supervision on leaving school are essential if the school is to make a proper contribution to the solution of this difficult problem.

A now well-known anomaly in the Education Act, 1944, was the exclusion from school of any child reported under Section 57 (3) as having been found incapable of education at school. This meant that if a child had been excluded from a special school because it appeared ineducable (presumably imbecile) or because it was inexpedient to educate him in association with other children (presumably emotionally disturbed) then whatever his subsequent progress he could not be returned to the school system but must remain in an occupation centre, if any was available, or at home or in an institution. As mentioned above, many children are emotionally disturbed and their deficiency is difficult to diagnose and assess properly. These children often improve considerably if their environment is altered and a maturation will often occur as they get older. However correct their original exclusion from school may have been, their permanent ineducability cannot be foretold with certainty and their case must be reviewed from time to time.

Fortunately for such children the efforts made on their behalf have now borne fruit in the Education Act, 1948, which removes this anomaly and allows their return to special school, or normal school, where suitable.

It should be noted that this recent enactment amends the statutory definition of feeble-minded persons given in section 1 of the M.D. Act. This no longer reads " or in the case of children that they appear to be *permanently* incapable by reason of such defectiveness of receiving proper benefit from the instruction in ordinary schools."

The new definition states : " or in the case of children involves disability of mind of such a nature and extent as to make them for the purposes of Section 57 of the Education Act, 1944, incapable of receiving education at school."

The Act further amends the list of defectives subject to be dealt with to read (in Section 2) " who is *for the time being* the subject of a report under the enactments relating to Education that he has been found incapable of receiving education at school or that by reason of a disability of mind he may require supervision after leaving school.''

When there is so much to be done, it is encouraging to find that at least some anomalies can be remedied and improvements made for the benefit of mental defectives. We who work in the mental health service are the ones who come up against its problems and it is we who should press for improvements. Complacency is the enemy of progress. Although there is much that is good in our mental deficiency services we cannot afford the illusion that all is well. Forty years ago Binet and Simon stated the aims of special education and indicated the method. Too much attention has perhaps been focussed on their tests, and too little on their objectives. Social conditions have changed greatly in the last half-century and it should now be possible to carry a greater proportion of defectives in the community than ever before. If our conception of the interrelation of defectives and the community is static and we remember only the lessons of past failures, we shall miss present opportunities.

I quote in conclusion the penultimate sentence from Binet's book : '' We shall grope, we shall make attempts, certainly we shall commit mistakes, which will not matter very much if only we have the mind to recognize them and the courage to put them right.''

IMPRESSIONS OF SCANDINAVIAN PSYCHIATRY.

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The Hospital System.—In all three Scandinavian countries there are two main types of hospital catering for psychiatric patients, the mental hospital proper resembling closely in its style and function the institutions of that name to which we are accustomed in Great Britain and the psychiatric clinic, a department of a general hospital. All three countries also have institutions for the mentally defective, Denmark and Sweden ones for criminal psychopaths and Sweden ones for the treatment of alcoholic addiction.

In all three countries there are two separate hospital systems, those run by the State and open to all the population, and those run by the large towns and open only to the citizens of the town in question, also in some cases to outsiders on payment of greatly increased fees. A fee is payable by those patients who can afford it, usually a very modest one of the order of one or two pounds a week. For example, in one University clinic patients are charged Kr.3 a day (about 4*s.* 6*d.*), whereas the actual cost is 30 Swedish kroner (about £2). In Sweden especially there is a complete consensus of opinion that the municipal hospitals are superior to the State hospitals, and the cities of Stockholm, Gothenburg and Malmo are justly very proud of their services. The teaching hospitals are departments of the Universities and independent. It is usual in Sweden for the University clinics to have private wards in which higher fees are payable and better amenities provided.

The Psychiatric Clinics fall into two categories, those which take only quiet, well-conducted patients, mostly of the type which here would be labelled "neurotic," and those which in addition take all psychiatric emergencies and a wide variety of disturbed psychotic patients, later to be transferred to the mental hospitals, so fulfilling the function discharged by the observation wards in the large English towns. The Swedish ones and the University Psychiatric Clinic in Oslo fall into the first class, and the Danish ones and the municipal psychiatric clinic in the Ullevard Hospital, Oslo, fall into the second. The general hospitals consist mainly of series of separate blocks housing the different specialties spread out in attractive grounds, the psychiatric clinic being housed in one of these blocks. An exception is the great Southern Hospital of Stockholm, where all the departments are under one roof and a part of one floor accommodates the psychiatric clinic. Dr. Wohlfahrt finds this latter arrangement very convenient and is convinced that it has more advantages than disadvantages. Occasionally one finds the psychiatric building some little distance from the main hospital as in Uppsala and the Oslo University Clinic, usually due to difficulties of siting. They vary in size from about 90 to 200 beds and excellent modern well-designed buildings seem to be the rule. Large dormitories are exceptional and there is a plentiful supply of single, two-bedded and four-bedded rooms. Dayroom accommodation is scanty in some hospitals, but good in the majority. The staffing is generous, on the lines of one nurse to 1½ to 2 beds, and one doctor to 10 to 20 beds. The structure of the medical staff is hierarchical, with a director at the top. The university clinics in the teaching hospitals are on the whole well supplied with nursing staff, but the others suffer from chronic shortage, necessitating in many cases closure of beds.

They practically all have waiting lists, and it is not uncommon for the less urgent types of case to wait several months for a bed. They enjoy all the diagnostic facilities of the well-equipped general hospitals, of which they form a part, and all the clinics which I visited possessed their own electroencephalographic machine. Research is carried on at many of them, from the strictly practical clinical trial of new compounds in the treatment of barbiturate poisoning undertaken at Bispebjerg to the elaborate biochemistry of Uppsala.

All run out-patient clinics and some of the hospitals which do not provide an " observation ward " type of service nevertheless see cases of acute psychosis as out-patients, and arrange their admission to the appropriate hospital. Most have one or two social workers attached to their staff and some undertake extensive arrangements for after-care. In Gothenburg, for example, convalescent homes and the boarding-out of patients on local farms are organized from the psychiatric clinic and not the mental hospital. Social workers are available in reasonable, but not sufficient, numbers, although there is no special post-graduate course in psychiatry for them as yet. Clinical psychologists exist only in Denmark. In Sweden it is quite common for nursing personnel to be trained to give intelligence tests. Most of the child psychiatry falls within the province of these clinics, but it made a late start in Scandinavia and is nowhere as highly developed as in this country. In Copenhagen large children's out-patient departments and 20-bedded in-patient departments exist at the University Psychiatric Clinic and at Bispebjerg ; Uppsala has similar facilities, the only ones in Sweden.

The approach in these hospitals is predominantly a somatic one, with emphasis on constitution and physical factors, such as intercurrent infection. The concepts of Kretschmer and Sjobring vie with each other for popularity and theories of psychopathology and the more dynamic aspects attract less attention. Physical treatments, E.C.T., modified insulin, prolonged narcosis with sodium amytal and other barbiturates, vitamin B administration, pyrifer for incipient schizophrenia and the Danish antabuse or its Swedish equivalent, abstinyl, for alcoholic addiction are much used. There is much awareness also in many quarters of the importance of social factors, and this is becoming universal, but one discerns only here and there the tentative beginnings of the organization of the more elaborate forms of psychotherapy as we know them.

The outstanding success of these clinics appears to lie in the integration which they have achieved between the psychiatric and general medical work, and it would now be unthinkable in these countries to plan a general hospital without a psychiatric department containing a substantial proportion of the number of beds.

The Mental Hospitals.—The general standard of those that I saw is high and compares very favourably with conditions in Great Britain. The best Swedish mental hospitals are a sight for sore eyes, with modern well-laid out buildings, interiors on the furnishing and equipping of which much care and thought have obviously been expended, smart, pleasant, intelligent staff and an absence of the distressing sights, sounds and smells which only too often are found associated with the care of chronic deteriorated psychotic patients.

Locked single rooms and mechanical restraints are dispensed with, and it is a matter of pride with the nursing staff to keep the quantity of sedative drugs administered down to the absolute minimum.

In one male disturbed ward, for example, only one-sixth of the patients were on regular sedatives, many of them only phenobarbitone gr. I *b.d.*, and emergency injections averaged only about one a fortnight. In another hospital sedatives are never given continuously for more than three days in succession. The patients show signs of receiving much skilled attention, and the more advanced stages of deterioration are rare. The cost is correspondingly high, in one of the best of these hospitals reaching £6 per patient per week, for example.

In all these countries there is a fairly generous standard of staffing, rather more than one doctor per 100 patients in most hospitals, and one nurse, assistant nurse, or male attendant between 2 and 3 patients. Shortage of nurses is a general difficulty and is met by dilution with assistants, and in some cases by closure of beds. In Sweden there is a shortage of doctors which prevents the filling of the establishment in some cases. The structure of the medical staff is again hierarchical, with as a rule a chief doctor (Overlakere) in charge of each side (male and female) of the hospital, with a deputy and several assistants in the larger ones. None of the mental hospitals do out-patient work, which is invariably left to the psychiatric clinics. Large, active, well-staffed and equipped occupational therapy departments are the rule, the general practice being to employ attendants and artisans who have had a short period of training in the mental hospital. The range of activities undertaken is remarkable ; besides the more usual weavers, carpenters, brush makers, basket makers and gardeners, one finds blacksmiths and craftsmen in wrought iron. The Occupational Therapy Department at Gaustad, Oslo, was started in 1856 and employs 70 per cent. of the hospital patients. That in Lillehaug, near Gothenburg, concentrates on attractive articles, preferably with bright colours, it being Dr. Hakon Sjogren's view that the making of pretty things has more therapeutic value than the making of useful ones, and the productions are used with great effect to decorate the wards.

Formal training and professional qualifications for occupational therapists do not exist in Sweden and Norway, and have only just been started in Denmark.

The buildings and other material resources are best in Sweden, and Denmark and Norway are for obvious reasons far behind with their building and development programme. In Norway there is real austerity, but great improvements have been achieved in the old buildings since the war by such simple measures as dividing up large wards with partitions and putting in more windows. In Gaustad there are many good mural paintings which have been procured by offering a prize in open competition of £250 for the best, and giving the impecunious young competitors free board and lodging while they worked. The new Swedish mental hospitals are mostly built in blocks housing about 80 patients each, with occasional smaller and some larger buildings. There is a 16-bedded villa for convalescent females in the Eastern Hospital, Malmo, but this type of construction is rather exceptional. The wards are light, spacious, comfortably furnished and well ventilated with good day-room accommodation and a fair number of single rooms. Care is often expended in the design of observation dormitories to make it possible for the night nurse to have her desk in an inconspicuous position in which the patients lying in bed can hardly see her, yet she can see all the patients. The design of the female observation dormitory at Malmo is particularly successful in achieving this. In Lillehaug much of the painting and colour scheme is the work of the expert in decor of the Gothenburg Municipal Theatre. About 60 per cent. of the patients are voluntary. The accommodation is already inadequate and most hospitals are overworked and have waiting lists for the less urgent types of case.

Treatment policy varies enormously from hospital to hospital, even those in the same town. In Dikemark, for example, great stress is laid on the elimination of focal sepsis and getting the patients into as perfect physical condition as possible, an otorhino-laryngologist-cum-dentist being employed full time, and no shock treatment is given. In Gaustad, on the other hand, insulin coma treatment, electric convulsion therapy with and without curare, and leucotomy are all in constant use, E.C.T. being regarded as a good substitute for sedatives in excited cases. In Stockholm there is a move to appoint psychotherapists to the mental hospitals, but nothing has been decided on. Mechanical restraint in the shape of belts and gloves is used in many hospitals, and I have heard it vigorously defended in Copenhagen and compared favourably with our own system of seclusion, it being argued that the loss of contact with his fellows is far more harmful to the patient. Continuous baths are universally regarded with disfavour and felt to be a rather cruel form of restraint. There is, on the whole, very little enthusiasm for insulin coma treatment, which is carried on only on a small scale and is generally considered to be ineffective.

Psychiatric Nursing.—In all three countries nurses proper undergo the standard three years' training in general nursing first. They can then get an additional diploma in psychiatric nursing after a variable time in a psychiatric clinic or mental hospital, from four months in Sweden to twelve months in Norway. Only fully trained nurses are eligible to take charge of the wards. Large numbers of nursing assistants or attendants are employed, especially in the mental hospitals, but also to some extent in the psychiatric clinics. They have three years' training in a mental hospital and pass comparatively simple examinations. In Denmark and Sweden there is no provision whatever for training men as nurses, and apparently this has never been even contemplated, the men being doomed to a subordinate role professionally, although there appears to be a few posts of an administrative character to which they can aspire. In Oslo there is an organization of a religious character which gives men a course of training lasting five to six years, and including social work, after which they are recognized as qualified nurses, but only a few individuals take this course. It has now been decided in Norway, however, to throw open the ordinary three years' general nursing training to men, and it is expected that male students will shortly be entering the hospitals. It is interesting to note that in Sweden the status of the nursing profession is high and the pay of individual nurses is good, a girl usually being able to count on getting the equivalent of about £500 per year soon after qualifying, yet the shortage is widespread, affecting the general hospitals in all their departments as well as the mental hospitals. The great modern Southern Hospital in Stockholm has wards closed because of lack of nursing staff.

Institutes for Psychopaths and Criminals.—In Denmark and Sweden psychiatry has penetrated much farther into the Courts of Justice and prison service than in this country. In Copenhagen the Ministry of Justice employ a full-time psychiatrist with the rank and pay of a director of a state hospital and furnish him with an observation unit in the prison and four assistants, these posts being much sought after as valuable experience by the aspirants in psychiatry. The prisoners are observed and examined for periods up to three weeks, and finally a report is prepared for the guidance of the Court, copies going to the judges and to prosecuting and defending counsel.

The personalities of the prisoners are studied by psychological tests such as the Rorschach and the thematic apperception, and by such devices as finding out who they admire, and getting them to write an autobiography. The Court expects an answer to three questions : Is the prisoner insane or mentally defective ? What sort of personality has he ? What treatment is advisable ? It is estimated that one psychiatrist can deal with up to 8 cases a week. Psychiatrists are rarely called on to appear in court, only about two or three times a year. There is a similar organization in Stockholm with a 75-bedded unit in Langholmen Prison headed by the professor of forensic psychiatry. All those accused of the most serious crimes, such as murder and arson, have to be psychiatrically examined, as do recidivists, but in other cases, whether they are examined or not is left to the discretion of the court. The reports are extremely lengthy and aim at presenting and marshalling all the facts to the court. They include the history as related by the prisoner, the history as compiled by the psychiatrist, the results of social enquiry, and a full description of the prisoners' physical and mental state. The courts follow the advice given in 90 per cent. of cases. Professor Rylander attributes this satisfactory result to the length and detailed nature of the reports which enable the reasons for the recommendations to be clearly understood.

In Sweden psychopaths may be adjudged socially irresponsible by the court and committed to special institutions in much the same way as a psychotic is committed to a mental hospital. In Denmark the procedure is somewhat different. For a person to be admitted to the celebrated Psychopathic Institution at Herstedvester with an indeterminate sentence it is necessary for him to be found guilty of a crime and for the court to have a certificate from a doctor that he is unlikely to be favourably influenced by ordinary punishment. This institution under the direction of Dr. Sturup has a definite therapeutic attitude, it being the aim to develop ties of friendship and affection between the inmates and doctors and other staff. Thus Dr. Sturup finds it important to seize the moment when a man is facing a crisis, in difficulties, and in need of help to offer support and help and explain how the faulty attitude of mind and behaviour of the inmate have brought about the painful situation. There is a total staff of 130 for 200 inmates, and attendants are expected to get to know well the men in their charge. The friendly feeling that the inmates have for the attendants is evidenced by the fact that it is possible to send small parties out into the town for the day in the care of one attendant and that it is practically unknown for men to give the attendant the slip in these circumstances. Juvenile courts do not exist in Denmark and Sweden, as juvenile delinquents are dealt with by committees of an organization known as Children's Welfare which has the power to dispose of children whom they find to be living in unsatisfactory circumstances in such a manner as they think fit.

The Teaching of Psychiatry.—As previously stated, the hospitals attached to all medical schools contain a large psychiatric clinic, almost invariably in the care of a professor of psychiatry who has complete authority over the clinical work and teaching. The undergraduates receive in the neighbourhood of 40 hours' instruction in psychiatry. Many teachers regard this as insufficient, and are pressing for a more extended course. Formal post-graduate teaching hardly exists, but aspirants to specialist status in psychiatry can get experience by holding junior posts in psychiatric clinics, mental hospitals, prison clinics and the like. In Denmark there is a definite scale of minimum experience of this type necessary for applicants for senior posts, in which junior posts in mental deficiency colonies play no part, even with regard to senior posts in mental deficiency colonies.

Genetical Studies, Social Surveys and Records.

In these matters in many respects the Scandinavian countries lead the world. Conditions are particularly favourable for genetical studies and social surveys, as population movements are small and there are many isolated, closely knit communities on islands and in remote valleys. The Institute of Genetics under Professor Tage Kemp in Copenhagen keeps a card index of all the hospital patients in Denmark and produces a constant stream of monographs on the familial incidence of various diseases. Professor Torsten Sjögren, of the Psychiatric Clinic at the Caroline Institute, Stockholm, has produced celebrated monographs in this field and undertaken work of the most painstaking and extensive character. Norway's achievements are perhaps not quite so great, but they have maintained since 1916 a system of card indexing of mental patients and of collection of mental health statistics which is superior to ours of the present day.

Laws Relating to Insanity and the Treatment of Mental Illness.

The system which is most novel and interesting to English eyes is the Danish. This is based on an eleven-year-old act which is very simple and confers considerable power on the doctor. Any doctor may issue a certificate which will authorize the relatives to remove a patient to a mental hospital, and the chief doctor of the mental hospital may refuse his discharge if he feels that it is prejudicial to his recovery, even though he entered the hospital voluntarily. The safeguards are the appointment of a guardian to look after the patients' interests, and the right of appeal to the Ministry of Justice against a refusal of discharge.

Both public and profession appear to be well satisfied with the working of this law.

Alcoholic addiction is a great problem in Scandinavia, and special institutions to which addicts can be committed have been set up in Sweden, where there is a lay body entrusted with the task of investigating charges of social irresponsibility due to alcoholism and of authorizing admissions to and release from these institutions. The organization is evolving rapidly and has obviously not reached its final form.

This brief account is necessarily superficial since it is based on only a fortnight's experience of Scandinavian institutions, that gained during the R.M.P.A. Study Tour plus a day spent in Gothenburg. Perhaps it may indicate to English-speaking psychiatrists where they can obtain help in the problems in which they are interested. I hope that my Danish, Swedish and Norwegian friends will forgive any inaccuracies, and that these are of not too glaring a nature.

DYNAMIC FACTORS IN APHASIA.

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The close relation of aphasia to lesions of particular brain areas may be responsible for the fact that factors other than lingual in their effects upon aphasic reactions have long been neglected. Pierre Marie (1906) came to the conclusion that in true aphasia the defect in language is regularly accompanied by a general intellectual defect. This opinion found little recognition; his statement was too general, and was not found to be in agreement with clinical experience. Head (1926) made a more elaborate attempt to break with the traditional ideas when he introduced the conception of symbolic expression and formulation, and viewed the clinical pictures of aphasia which came under his observation from a more general angle. Goldstein (1924, 1926), in applying the Gestalt conception to aphasic disorders, brought the brain function as a whole into the picture. He found the basis of aphasic disorders in the inability of figure-background formation and categorical behaviour. Such extra-lingual factors have consequently been considered in the analysis of particular cases by several authors (Woerkom, 1925, 1931), Bowman and Gruenbaum (1925), Klein (1929, 1931, 1932). Demonstrated on two aphasic patients, they are also the subject of this paper.

The first patient, an efficient district nurse, single, aged 52, had been on two previous occasions in this hospital with a depressive picture. A week before her present admission she was found holding her head and talking in a disconnected, incomprehensible way. She seemed to be unable to grasp what was said to her. As her condition did not improve she was taken to hospital. On admission her speech consisted mainly of severe, jargon-like paraphasias which made it mostly impossible to obtain an idea of what she wanted to express. This is an example of her spontaneous speech in conversation : " What my power . . . watch to stone . . . my drop, my pass . . . is te soon gone . . . I am staff, chope, chook . . . my harage gone . . . my gone . . . younger beings gilt . . . my joid . . . I wish Gods fuddle . . ." She made great efforts to express what was in her mind. There was a consistent attempt to put into words something definite and concrete; this was demonstrated by utterances which were partly correct and could be interpreted. She frequently supplemented her deficient speech by gestures and expressions. She often tried to correct her mistakes, and expressed her impatience and discontent by facial expressions when she did not succeed. Her speech was slow and it took some time before she started, although she had no difficulties in articulation. Occasionally when she did not succeed in expressing herself satisfactorily she tried to spell out the words, with an equal lack of success. The naming of objects was met by similar difficulties as her conversational speech. She could rarely give a correct answer. The word-confusion was mainly literal and there was little resemblance to the correct name. She was unable to repeat syllables or words, nor could she produce word series. During conversation there was never any tendency to take up in her speech words or sentences of the examiner. There was a very severe word-deafness. She only occasionally grasped part of a simple question or order given to her, and was unable to pick out a particular object named from a number exposed. Her reading aloud was paraphasic similarly to her spontaneous speech, but she understood written language slightly better than the spoken word. Her writing was very poor. She produced incomplete words when asked to write spontaneously or on dictation. Copying was better; it started well, but became confused later. She could not be induced to draw or to copy drawings. She knew how to use objects, and carried out correctly simple actions such as combing, striking a match, etc. A more detailed testing of constructive abilities was not possible, partly because of her word-deafness. On neurological examination a dropping of the right angle of the mouth at rest and at innervation was found. There were no other pathological signs of the C.N.S. The blood pressure was 240/135 mm. Hg, and the retinal vessels showed arteriosclerotic changes. In the course of a three-month observation the speech improved slowly. She was then able to express herself better, but word paraphasias were still marked and constructional mistakes now became evident. She still showed considerable disturbance in comprehension. The character of the speech defect had remained the same.

The second patient, a labourer, 58 years old, was at work up to a week before admission. He was said to have been a sociable man and a reliable worker. He complained of heavy pain in the head. After a few days' rest in bed he became extremely voluble and started to talk nonsensically. Then he became irritable, excited and suspicious, and had to be taken to hospital. When admitted he had a tendency to logorrhoea. He kept on talking until interrupted. The following is an example of his conversational speech: "Well not too bad, I suppose, it is not too well, let me see, I should not be able to get a place anyway, well not too much I suppose, there is nothing wrong with me, when I went to the first place, just the same, yes doctor just the same. I came round with her, not too bad, she used to be with me all my life." Similar phrases made up most of his conversation; occasionally some word confusion slipped in, as: "I don't care to be forminded, I don't forget my gent to-day, it is all you have to is my idents, my ardents that you met me doctor." He often reacted before the examiner had finished his question. The sentences were usually in good grammatical order and spoken with the correct intonation. There was perseveration in his speech. Though the sentence formation was usually correct it conveyed little meaning and there was little interconnection between his utterances. Though he frequently repeated correctly some of the expressions of the questions put to him during a conversation, he did not do so when specially tested for repetition. Neither did he continue word series. In naming objects he rarely succeeded in finding the proper expression. He produced severe paraphasias at the beginning of the test; his stock phrases followed if they had not made their appearance from the start. His comprehension was very much impaired. He rarely understood the spoken word either in conversation, or on simple orders. Often he began with a relevant response, but soon lost the trend of his thought and carried on with his usual phrases. Only now and again did he read a word correctly; mostly his reading was severely paraphasic. He did not show any sign of understanding the written word. His writing, both spontaneous and on dictation, was strongly paragraphic and persevatory; copying was much better, but not without mistakes. He did not draw from memory, possibly because he was unable to understand what he was asked to do. Copying of drawing was accurate. He had difficulties in putting together pieces of a simple jigsaw puzzle; he did it in a haphazard way, without planning. He did not know what to do with a cigarette lighter, matches, keys, when given to him for handling. There was no pathological finding on neurological examination. W.R. was negative. Blood pressure was 160/100 mm. Hg. In the course of an observation over a period of 3½ months the flow of speech became slightly less, his comprehension became better. At times his answers in conversation were more to the point. His writing on dictation improved slightly. Otherwise the picture had not changed. Stock phrases predominated in his speech reaction and there was still considerable perseveration.

When we compare these two aphasic patients we find that they are unable to express themselves, to name an object by its correct name, to understand what is said to them, to write or to read properly. Yet the total impression we obtain from their speech reactions is entirely different in the two cases. This is specially striking in the conversational speech. In the first case the speech is slow, the sentence formation is incomplete, word-confusion with literal paraphasias and perseveration is very marked. In the second patient the flow of speech is easy and, if anything, increased, the sentence formation is good and mistakes are not frequent. Word-confusion when combined as in these cases with disturbances in comprehension, reading and writing can be regarded as a disorder of the internal language. Since this disorder seems to be of about the same gravity in both cases, the entirely different character of their speech behaviour must be due to other factors. Though it is true to say that the conversational speech of the second patient is almost correct, this is so only from a purely linguistic point of view. Otherwise it is not a satisfactory speech performance ; it consists of ready-made phrases of general character, with little or no inter-connection between them and little specific meaning. It is a kind of speech similar to that which Jackson called inferior speech, utterances which appear involuntarily as an emotional or automatic speech response. Such speech is, according to Jackson, organized at a lower level, and can often still be retained when functions of a higher order have broken down. This explanation may also apply to the retention of phrases of inferior quality in our case. As they are more automatized we might expect their greater resistance to destruction. But the problem remains that the automatic speech material appears so readily in one case and not in the other, although the disturbance in linguistic capacities is of the same severity in both cases. Explanation is therefore needed of the fact that the speech progresses in one case whenever possible in an automatic way while it is disautomatized in the other. As it is difficult to make the second patient produce speech other than that of a lower order, so it is impossible to induce automatic speech in the first patient. While articulatory difficulties are absent there are indications in the first case that the speech function is inhibited. Speech is slow, the sentences short and often incomplete with prolonged intervals between them. The reaction time is prolonged. There is lack of inhibition in the second case ; the reaction time is shortened, there is a continuous flow of speech, with scarcely any intervals until the patient is stopped. This conforms with the disautomatization of speech and speech automatism respectively.

Inhibition and release must be due to some regulatory mechanism preceding speech formulation. It can be assumed that some scheme of thought is, as a rule, precedent to speech. This scheme may consist of a particular line of thought, a certain trend without a definite structure, or it may be structural thinking. This thought structure may be only loose and become more definite in the course of speech evolution, or it may be a more tight and well-formulated structure. The choice left to the subsequent speech formulation to follow its own pattern can therefore vary considerably. Under normal circumstances it is largely dependent upon the speech situation, the purpose of speech and probably the type of personality. There is, however, under ordinary conditions no difficulty in adjusting speech resources to the preceding scheme. Under pathological conditions, when general cortical functions are involved or when a speech disorder is present, adjustment between thought and speech can be expected to become more difficult and the progression of speech may consequently be affected.

There is evidence of such difficulties in the thought-speech relationship in our two cases. The speech of the first case is controlled. The patient is trying to express something definite. She adheres strictly to a precise scheme of thought in her speech formulation. She endeavours to cover and express by her speech construction and choice of symbols a preconceived thought structure or conception, as exactly as possible whatever the situation is, whether conversational or test. As this effort at accuracy and completeness is too ambitious for the language resources at her disposal she is bound to fail, with a resulting constructional and word confusion. At the same time it prevents the release of more automatized speech, which potentially she is still able to perform. In contrast no precise thought structure precedes speech formulation in the other patient. When such structure emerges or is enforced upon him he takes it up in a casual way only to drop it, and his speech again follows a vague line of thought or, if at all, loosely structural thinking. This is particularly striking when he has to name an object. In his first attempt to do so he may produce a paraphasic word which is intended to express his conception, but he is immediately carried away by his usual phrases. Without the restriction of more concise thought such speech material is therefore set free which is in the range of his reduced language capacities. These cover only automatized speech, and this is, in fact, of what his conversational speech consists.

The two aphasic pictures here described, though common in their main structures, are difficult to put into any scheme. The first patient may give the impression more of a motor, the second of a sensory aphasia, but they have both the same heavy disturbances in comprehension. In analysing aphasic reactions we have to distinguish between actual loss of language abilities, which can be expressed as a disorder of internal language or the loss of symbols of language, and the way the afflicted person turns the remaining language capacities into speech. It is the distinction between language as a potential capacity and speech as a function: one is a static factor, the other involves a dynamic factor. The available language resources in aphasia can vary according to the severity of the lesion, but their difference in aphasic patients is only quantitative. The way, however, the remaining language capacity is utilized for speech varies in character. The factors involved are of peripheral (innervatory) and central nature. The peripheral factor interferes only in certain cases with the execution of language and is not under consideration here. The central mechanism is always involved as a factor which influences the speech progression in one way or another. In Goldstein's opinion the brain mechanism as a whole is altered whenever a functional disturbance occurs in brain lesions; there is a difficulty in integrating adequately the particular functional disorder into the brain function as a whole, consequently the figure-background formation becomes faulty and this gives rise to abnormal reactions. The figure-background formation is probably faulty in both our cases. But more specific factors are needed to explain the difference in their aphasic reactions. We found the nature of the preceding thought process, the way in which it mobilizes the existing language resources, the determining factor. If the patient approaches his reduced language capacities by attempting to shape into speech a tight thought structure he is bound to fail altogether. If such a structure is more or less absent, speech automatism can freely develop. The first approach can be called global, the second focal.

The global approach is not always so marked as in our first case. There are speech situations, as for instance in word series and repetition, which specially facilitate an automatic approach. The patients may be able to give up their essentially global approach in these situations. Variations of this kind may be due to individual factors. We may expect tension to arise when, as in this group of aphasics, a set scheme has to be actualized by inferior means. The degree of tension, and with it probably the degree of speech inhibition and word confusion, may depend upon the make-up of the personality. There are further, the premorbid speech habits to consider. They may influence the style of the aphasic reactions, and favour either a global or focal approach to speech situations and so intensify or mitigate one or the other reaction type.

In the second group, in which the focal or automatic approach prevails, Marie's assumption of a special dementia seems to have some justification. There is in our second case, in contrast to the first case, an absence of ordered thinking, not only connected with speech, but with other functions as well. His thought process is erratic, his thinking is poorly formulated and incomplete, but this in itself does not produce the aphasia. We may, however, expect in this group of aphasics the specific language disorder to be frequently associated with a disturbance of general brain functions.

A process which involves both functions in the course of the illness is senile dementia. On a series of seniles and preseniles of the Alzheimer type which we observed, three stages of speech disintegration could be distinguished. In the first stage difficulties in naming appear, the speech is somewhat impoverished, but there are otherwise no definite signs of a disturbance of the internal language. In the second stage the flow of speech is increased, the speech becomes simpler, consisting mainly of phrases of little variety. Spelling and writing is impaired, word and literal paraphasias appear and in details understanding is faulty. In the third stage there are no spontaneous speech impulses; the patients respond with a few stereotyped phrases, often incomplete, or they mostly repeat part of what is said to them. Comprehension is greatly reduced or absent. In the first stage the speech resources are slightly involved whilst the intelligence has noticeably decreased. When therefore the speech evolution follows loosely structured thought no difficulties arise. In situations where a precise conception has to be formulated, as in naming, difficulties occur. In the second stage a marked loosening of thought structure and difficulties in internal language are present. There is little thought direction, no ordered scheme of thought which might tie up or restrict speech evolution. Accordingly, the flow of speech is increased and speech is of a lower order; word confusion appears mainly when a global approach is enforced upon the patients. In the last stage both intellectual faculties and internal language are of a very low level. In the absence of intellectual activity there is no spontaneous impulse to speech; reactively only the most automatized and uncontrolled speech formation, such as repetitions and a very small set of the simplest phrases, is possible. These observations illustrate the automatic approach to speech situations throughout, when in the progression of a general brain process intellectual functions and internal language are involved at the same time. They show also that the automatic approach becomes more marked with the increasing disintegration of thought, and the speech automatisms more primitive with the progression of internal language difficulties.

CONCLUSION.

In the differentiation of aphasic reaction types two factors have been separated—the defect of internal language and the way in which the defective language resources are mobilized. This mobilization, as demonstrated on two cases, was found mainly dependent upon the approach to speech by the preparatory thought process. Two different ways of approach were distinguished :

(1) A global approach where ordered and structured thought precedes language formulation, enforcing itself on language construction. This rigid adherence to an elaborate scheme, which is too ambitious for the reduced language resources, leads to speech inhibition, constructive and word-confusion. (2) A focal or automatic approach in which structural thinking is very loose or altogether absent. There is therefore no restricting factor, no straight jacket for speech evolution, and speech can progress freely along lines of existing language capacities. Speech material of inferior order will therefore be released in an easy flow of speech. The interaction between progressive intellectual deterioration and progressive internal language disorder and its effect upon speech has been followed up in a series of seniles and preseniles.

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NEUROSIS IN THE WOMEN'S AUXILIARY SERVICES.

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PSYCHIATRIC disorder, according to the recently published statistical report on the Health of the Army,* constituted one of the most common medical causes of discharge of A.T.S. from the Army, and was among the most frequent causes of admission to hospital.

Although fairly extensive literature exists on psychiatric disorder in soldiers, very little has been published on neurosis in the women's services. This is indeed surprising in view of the importance of the subject judged, not only by the magnitude of the problem and its bearing on wastage of man-power and loss of working capacity, but also by its measurement in terms of human suffering. Furthermore, the matter is of special interest since World War II saw the entry of women into the forces in large numbers, involving from the Service point of view, new problems of military organization and training, and for the individual, special problems of adjustment to the transition from civilian to military life.

The striking success of the part played by women in the forces makes the need for study of the causes and form of psychiatric breakdown even greater. The importance of these factors in the present recruiting drive needs no special emphasis.

In a survey of neurotic illness in women service patients the following interesting questions immediately crop up :

1. What is the form and symptomatology of neurosis among women service personnel ? Are women service patients prone to special forms of neurosis or symptoms ?
2. What are the main causes of psychiatric illness in the women's services ?
3. What is the importance and nature of constitutional factors in the predisposition to neurosis ?
4. The precise role played by extrinsic or environmental influences in the causation of psychiatric disorder.
5. Are there any special conditions of service that impose a particular strain in adjustment for women and, if so, what part do they play in the development of neurotic illness ?
6. What is the prognosis for return to duty and the factors influencing response to treatment ?

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* Statistical Report on the Health of the Army, 1943–1945. H.M.S.O., 1948.

7. What proportion have to be invalided from Service? What proportion of those returned to duty perform their duties satisfactorily?

8. What measures can be taken to achieve effective preventive psychiatry?

In this article an attempt will be made to answer some of the questions from data obtained on 2,000 women service neurosis patients successively admitted to Mill Hill Emergency Hospital from 1942–1944. Special reference will be made to a group of 500 women service patients personally treated by the author.

DESCRIPTION OF POPULATION.

The group of 2,000 auxiliaries were mainly A.T.S. Included in the group are also some 10–15 per cent. W.A.A.F. patients and a small proportion of W.R.N.S. As the groups from the three services resembled each other closely it was not thought necessary to consider each service group separately.

The group cannot be taken as a representative sample of the psychiatric material of the women's services as there was a negative selection of mental defectives and psychotics, and when these were admitted it was a result of error in diagnosis or selection. The patients were positively selected because it was considered they required investigation or treatment at a neurosis centre and would not, therefore, include milder cases treated as out-patients or those discharged directly from a unit or other hospitals on grounds of neurosis.

TABLE I.—*Age Distribution.*

	Neurotic group (1942–1944).	A.T.S. (1943).
Age 16–25	75%	76%
,, 26–30	13%	16%
,, 31–40	19%	10%
,, 41 and over	2%	4%

The age distribution roughly corresponds to that of the A.T.S. in 1943. The 31–40 age group shows a higher proportion in the neurotic group. It is difficult to assess the significance of this difference as the age distribution of A.T.S. varied at different times of the war, mainly depending upon the age groups of recruits.

Fifteen per cent. of the group were non-commissioned officers. Twenty per cent. of the group were married, and 19 per cent. engaged to be married. The proportion of married auxiliaries showed considerable fluctuation during the course of the war. The statistical report on the Health of the Army estimated the proportion of married auxiliaries as 1/7th. Again it is difficult to attach any significance to the difference since various factors are involved which cannot be adequately controlled.

Regarding civil occupation, 13 per cent. of the group were in skilled occupations; 31 per cent. semi-skilled, and 48 per cent. unskilled. Only 7 per cent. had not been in the labour market.

TABLE II.—*Type of Illness.*

Anxiety state	Acute severe	5%	42%
	Acute mild	15%	
	Chronic	22%	
Depressive state	Mainly reactive	24%	28%
	Mainly endogenous	4%	
Hysteria	Conversion type	24%	28%
	Dysmnesic type	4%	
Obsessional state		2%	
Schizophrenia		2%	
Paranoid state		0·2%	
Mental deficiency		0·4%	
Epilepsy		0·4%	
Organic mental syndrome		0·4%	
Physical disease not included under organic mental syndrome		4·0%	
No illness		1·0%	

TYPE OF ILLNESS.

Table II shows the percentage distribution of diagnostic categories in the group. It should be noted that in some patients multiple diagnoses were necessary, e.g. hysteria and mental deficiency or depressive state and psychopathic personality.

The high incidence of affective disorders (anxiety and depressive states) is striking, accounting for 70 per cent. of the total.

Hysteria was diagnosed in 28 per cent.; the majority showed conversion symptoms, whereas dysmnesic symptoms such as fugues, amnesia, etc., were only found in a small proportion of the group. Obsessional state was a comparatively rare syndrome diagnosed in only 2 per cent. of the female cases, just as it was a comparative rarity in soldiers admitted to Mill Hill Emergency Hospital (2 per cent.).

The low incidence of schizophrenia, mental defect, epilepsy and organic mental disorder was to be expected, since these would not normally be referred when diagnosed. The schizophrenics who were admitted were atypical, and often masqueraded as depressive states, the true nature of the underlying disorder becoming apparent only after investigation in hospital.

DIFFERENTIAL SEX INCIDENCE OF NEUROSIS AND SYMPTOMATOLOGY.

It is a matter of considerable interest to know whether women are prone to special forms of neurosis or to special symptoms. Comparison of some 200 items relating to history, aetiology, symptomatology, diagnosis, etc. between a group of 5,300 neurotic soldiers and 2,000 women service neurosis patients showed a general similarity in the distribution of the various items. Some features, however, showed significant differences.

Where statistically significant differences are found, they would not necessarily indicate a biological sex differentiation as the difference in distribution may be due to other factors, e.g. age or selection factors which might be difficult to ascertain and control.

The male group showed a statistically significant higher incidence in the following features:

	M. %	F. %	Difference. %
1. Anxiety states	58	42	16
2. Somatic anxiety symptoms	46	28	18
3. Stammer	8	2	6
4. Tremor	27	17	10
5. Pain not demonstrably organic in origin	25	16	9
6. Stress of bombardment or exposure to enemy action as a contributory factor	20	5	15
7. Duration of illness more than one year	67	33	34
8. Gradual onset of illness	77	66	11

The most notable differences are in the significantly higher incidence of anxiety states and somatic manifestations of anxiety in soldiers.

The well-known differential sex incidence of stammering is borne out in this series.

The male group contains a higher proportion of chronic neuroses and the difference noted in incidence of anxiety state is attributable to the relatively high incidence of chronic anxiety state in men.

The higher incidence of stress of bombardment or exposure to enemy action as an aetiological factor in the male group was to be expected in view of the different degrees of exposure to enemy action.

The female group shows a higher incidence of depressive symptoms. The duration of illness before admission was shorter than the male group and a higher proportion had illnesses with acute onset.

It is desirable to consider the age distribution of the male and female groups in order to determine whether age factors could account for any differences. Comparison of the age distribution of the two groups shows that the female group has a higher proportion of individuals of younger age groups. There is, however, no evidence to suggest that the differences in symptomatology could be attributable to the age factor.

AETIOLOGY.

Multiple causation is the rule in the aetiology of psychiatric disorders wherein various intrinsic and extrinsic factors may interplay in infinite variation in the development of neurosis or other psychiatric illness.

The assessment of the relative importance of intrinsic or constitutional factors and environmental or exogenous factors is of great importance, both in treatment and assessing prognosis.

CONSTITUTIONAL FACTORS.

The concept of constitutional predisposition to neurosis has been considerably clarified by Slater (1943). The individual constitution is the sum total of physical, physiological and psychological attributes of a person, mainly determined by heredity, and only secondarily modified by environmental influences. Environmental influences can modify individual constitution either by organic disease or by physiological or psychological conditioning. Slater (1943) has clearly shown that the degree of stress that can be tolerated by an individual before neurotic breakdown is directly related to the degree of neurotic constitution.

Slater (1943) maintains that the following are, in order, the best indicators of neurotic constitution :

1. Clinically abnormal personality.
2. Neurosis in childhood.
3. Poor work record.
4. Repeated nervous breakdown.

The assessment of these factors will enable us to obtain an estimate of the degree of neurotic predisposition in our group of female neurosis patients.

CLINICALLY ABNORMAL PERSONALITY.

Only 43 per cent. of the group were judged to have had a well-adjusted and stable previous personality.

The following is an item analysis of abnormal personality attributes in the group.

Anxious and highly strung	68%
Unstable and maladjusted	57%
Weak, dependent and timorous	36%
Hysterical traits	32%
Cyclothymic tendencies	30%
Obsessional traits	29%
Aggressive and rebellious	26%
Hypochondriacal traits	23%
Inert, lacking initiative	20%

Thus a high proportion of the service women who broke down with neurotic illness showed a high degree of neurotic constitutional predisposition as shown by various forms of clinically abnormal personality, with a notably high incidence of abnormality in the forms of dysthymic traits.

NEUROSIS IN CHILDHOOD.

Nearly half of the patients (46%) had a history of neurotic symptoms in childhood, such as enuresis, somnambulism, tantrums, anxiety reactions and other forms of maladjustment.

POSITIVE FAMILY HISTORY.

A family history of nervous and mental disorder occurred in 58 per cent. of patients as follows :

Neurosis	52%
Psychosis	4%
Epilepsy	1%
Mental deficiency	1%

Symptoms were similar to those of parents or siblings in 15 per cent. of cases. Here again we find evidence of the neurotic constitution as indicated by positive family history occurring in a high proportion of cases.

Poor work record is a very useful pointer of instability. Poor work record may take the form of unduly frequent changes of employment, becoming fed up easily with a job, and giving it up without adequate reason ; repeated dismissal after quarrels with colleagues or employees or because of inefficiency or unreliability. Further forms of poor work record are degradation in type of work. The data available do not permit of a complete estimate of this factor except to state that 16 per cent. of the group had considerable loss of working time before enlistment and 4 per cent. had a degraded work history.

Previous neurosis.—Twenty-three per cent. of the group had previously received treatment for nervous symptoms. This is a minimal estimate of previous incidence of neurosis, since many patients would not have treatment, or the condition may have masqueraded as a physical or psychosomatic disorder, and not been diagnosed as a frank neurosis. A definite illness was quoted in 16 per cent. and evidence of a clear predisposition to psychiatric disorder was noted in 40 per cent. of the group.

Therefore, analysis of these pointers of neurotic constitution indicates a high degree of constitutional neurotic predisposition in our group of female service neurotics.

The importance of this finding lies in the fact that from the outset there was clear evidence in the history and previous personality that these patients would only be able to stand a limited degree of stress before breakdown. Furthermore, degree of constitutional predisposition could have been fairly readily assessed on enlistment.

INTELLECTUAL ENDOWMENT.

Poor intellectual endowment and neurotic constitution according to Slater are the two most important factors in predisposing to neurotic illness. It is therefore also important to consider the possible role played by poor intellectual endowment in the predisposition of neurosis in our group.

An assessment of intellectual capacity can be made by—

1. School and work record.
2. Intelligence test scores.

School Attainment.

The following is percentage of educational level reached by patients in one group.

Elementary poor (Standard V and below)	7%
Elementary good (above Standard V)	64%
Central or secondary	31%
Higher education	1%

Only 7 per cent. of the group did not pass Standard V in elementary school, and this low percentage is a tribute to the efficiency of the selection procedures on enlistment.

Intelligence Test Results.

Each patient was tested with Raven's Progressive Matrices on admission to Mill Hill Emergency Hospital, and the following is the percentage distribution in various grades.

	Neurotic A.T.S. group (female).	Serving population.
Grade I (superior)	13%	8
Grade II (above average)	20%	19
Grade III (average)	40%	39
Grade IV (below average)	14%	21
Grade V (low intelligence or defective)	3%	7

The score shows a higher distribution of above-average intelligence grades, and a lower incidence of below-average intelligence scores. This inequality of distribution is probably due to the elimination of the majority of S.G.5 recruits by selection procedures on enlistment. The female group has a higher intelligence distribution than the group of neurotic soldiers.

Thus, whilst on the one hand we find strong evidence of neurotic constitution in the group, we find little evidence on the other to support the contention that poor intellectual endowment was an important predisposing factor in the group as a whole; when operative this could apply only to a small proportion of the total.

Having considered the main constitutional or intrinsic factors, let us now turn our attention to extrinsic factors.

Environmental or Extrinsic Factors.

The main effect of environmental factors is to determine the time of manifestation and, to a lesser degree, the severity of the condition. Environmental factors may be precipitating, contributory or dominant in the aetiology of the disorder.

The following environmental or extrinsic factors may be important in the aetiology of neurosis in service patients:

1. Domestic stress.
2. Wartime separation and regimentation.
3. Marital problems.
4. Financial problems.
5. Unsuitable work.
6. Exposure to enemy action.
7. Physical strain or illness.

Stress of wartime separation and regimentation was considered to be a contributing factor in 52 per cent. Domestic problems constituted an important factor in 40 per cent. of cases; unsuitable work was a contributing factor in 24 per cent. Physical causes (infectious illnesses, etc.) were important in 8 per cent. only, and only in 5 per cent. was exposure to enemy action a contributing factor.

Thus the most common environmental stresses were wartime separation, regimentation, domestic stress and unsuitability of service work.

INTERPLAY OF INTRINSIC AND EXTRINSIC FACTORS.

Psychiatric disorder is nearly always of multiple causation resulting from an interplay of intrinsic (endogenous, constitutional) and extrinsic factors. The various factors may be additive or synergic in the production of neurosis. In considering environmental stress one has always to consider the individual predisposition and reaction to the particular stress under consideration because, people not only vary in the amount of stress that can be tolerated before breakdown, but differ in the specificity of main causative factors. Thus, in the development of neurosis in A.T.S. and other women service personnel, constitutional factors will determine the degree of stress tolerance, and also to some extent the response to various factors.

Thus we have to consider:

1. Constitutional predisposition.
2. Environmental stress.
3. Personal and individual reaction, interests, motivation, drives, ambitions, attitudes, etc., which may conduce to the development of neurosis, or, on the other hand, hinder the manifestation of neurosis in a predisposed person.

Service life to women presents certain features which require special adjustment as they conflict with habits and attitudes established in civilian life.

1. *Uniformity.*—Enlistment in the service means a greater degree of conformity in dress, régime and daily routine than women are accustomed to. There tends to be a sinking of individuality in service life which women are inclined to resent, whereas in civilian life the trend was to be distinctive and individualistic within socially accepted limits.

2. *Discipline.*—Women are not so accustomed to discipline in daily life as men. They often enjoy a relatively high degree of independence at home or work and resent the rigidity of service discipline.

3. *Lack of privacy* in eating or sleeping is another feature of service life which women specially dislike. The desire for privacy is a need strongly felt by many women, and many spontaneously remark that the comparative lack of this in service life is a constant source of irritation.

4. *Breakdown of class differences.*—This may constitute a particular stress for some individuals who have difficulty in mixing with people of different social strata or with different standards, attitudes and interests.

These aspects of military life constitute stresses and strains in adjustment to normal service personnel as well as those who develop neurosis; they can only be given a minor rating in the causation of neurosis but are probably of contributory significance in individuals already highly predisposed to neurosis and maladjustment.

MOTIVES.

Motives underlying voluntary enlistment may greatly influence adjustment to military life, and contribute to success or failure in a military career.

Some volunteer for purely patriotic motives ; others in order to avenge the loss of a dearly loved person, such as fiancé, brother or other member of her family. In some, enlistment offers an opportunity of overcoming feelings of inadequacy or unwanted attributes of femininity. The military uniform, the activities and regimentation of service life in some cases is an opportunity for meeting a desire for masculine identification.

These motives, in the appropriate setting, can help adjustment to military life and contribute to a successful career. Other motives are less salutary. Some women volunteer impulsively for glamour and excitement ; others join out of pique following a quarrel with fiancé or family.

A number of neurotic patients with life-long histories of symptoms joined the Army in the hope that service life would cure their nervous symptoms. Others joined in order to get change of employment because they had been unable to adjust themselves satisfactorily at work in civil life. Some enlisted in order to escape from an intolerable situation, e.g. to get away from a stepmother, a tyrannical father, or a cruel husband. These motives are not usually, *ceteris paribus*, salutary and are not conducive to stable and successful adaptation to military life.

FAMILY SITUATION.

The stresses relating to family situation are many and varied. In some cases the patient is overdependent and timid and cannot stand separation from home. Sometimes the parents are frankly neurotic and have an unsatisfactory attitude towards the patient. Parental discord ; loss of one of parents ; remarriage of father and inability to get on with stepmother are typical examples of family stress.

Sixteen per cent. of the group for various reasons had an upbringing other than by parents, and in these patients this seemed to be a predisposing factor. Unsatisfactory home atmosphere in early life occurred in 30 per cent. of the group.

In some patients a family catastrophe, such as loss of parents or siblings in air raids, or through sudden illness, or husband or near relative being reported missing, were the main precipitating factors.

Financial and housing problems, air-raid damage, parental discord, family quarrels, were precipitating factors in other cases.

ATTITUDES.

Certain attitudes were prepotent in predisposing to neurotic breakdown in some cases. Some patients had been over-protected by parents all their lives. They had always been regarded as delicate and were forbidden to play games or participate in any form of robust activity. Some patients, on account of effort intolerance and possibly a functional murmur, had been diagnosed as "weak heart" or "undeveloped heart," etc., with a development of iatrogenic invalidism and hypochondriasis and, in some cases, incapacitating neurosis. The very serious consequences to the patient of a diagnosis of heart disease when none is present is strikingly demonstrated in these patients.

SPECIFIC DISABILITIES.

In one or two patients specific disabilities such as congenital alexia were dominant factors in causing breakdown, even when the individual was of high intelligence. The problems resulting from the presence of this specific reading disability in service life, together with the patient's sensitivity to it with emotional reactions of suspicion or aggression, may ultimately give rise to neurosis.

UNSUITABILITY OF WORK.

Some patients, though heavily predisposed, might have adapted satisfactorily if given suitable work in the Services. In fact, unsuitable work was found to be a causative factor in 15 per cent. cases. Work may be unsuitable in the following ways ; it may be beyond the patient's capabilities or, on the other hand, may be too dull and monotonous, or not up to the intellectual capacities of the patient. The patient's interests may conflict with the nature of the work, or in some patients working conditions or location of the work may be the important factors.

In many of these cases change of occupation and reposting under the Annexure Scheme enabled a large number of patients to be retained for useful service who would otherwise have had to be discharged.

SEX.

Problems regarding sex matters played an important role in aetiology in very few patients. In 18 per cent. of cases sexual activity was subject to worry. This included worry over masturbation, guilt feelings regarding premarital intercourse, etc.

Homosexuality was rare and occurred in less than 1 per cent. Similarly, neurosis arising out of worry over illegitimate pregnancy was very rare.

MENSTRUAL FUNCTIONS.

In a certain proportion of patients premenstrual tension was severe and in some patients amounted to a severe temporary disability. The tension usually developed about two or three days before the onset of the period and usually passed off on the second or third day of the period.

The general increased tension was accompanied by anxiety feelings, irritability, depression, and in some cases by swelling in the legs, swollen painful breasts, pruritus, etc. Progestin administered 10–14 days before the period appeared to help some of these cases. In one or two patients the premenstrual depression was very severe and of suicidal intensity, but again showing the characteristic recession at the beginning of the period.

Physical Illness.

In the 8 per cent. in whom physical illness played an important part in the aetiology of the neurosis, the most common physical illnesses were infections, such as influenza, tonsillitis, bronchitis, etc., which sometimes left residual symptoms of depression, irritability, fatigue, dizziness, tension, etc. These patients responded well to general rehabilitative measures of hospital régime, and as a rule formed a group of good prognosis usually recovering sufficiently well to return to full duty.

Head injury *per se* was not an important factor in many cases, and any resulting or residual disability or symptomatology complained of by the patient was, in the main, neurotic rather than physiogenic.

Previous physical illness or defect served to pattern the neurosis in some, e.g. post-diphtheritic paralysis which cleared up completely was followed by the development of hysterical paresis of the same muscles under stress ; chronic otitis media with super-added hysterical deafness ; hysterical blindness superimposed on life-long myopia.

Duration of Service.

The percentage distribution of the group with regard to duration of service was :

Less than 1 year . .	23%
1–3 years	63%
3 years and over . .	13%

It is interesting to note that, during the first year of service, only 23 per cent. developed neurotic symptoms of sufficient intensity to necessitate admission to a neurosis centre. The majority of patients had from 1–3 years' service before admission to Mill Hill. This indicated that the process of adaptation to the transition from civil to military life is not an important factor in precipitating neurosis in many patients.

Duration of Illness.

Less than 1 month . .	3%
1–3 months . .	16%
3–6 ,, . .	23%
6–12 ,, . . .	24%
Over 1 year . .	33%

It is interesting to note that patients are not as a rule referred to hospital in the early stages. This may be due to many factors, such as :

(i) Trial with out-patient treatment or treatment at unit or postponement of treatment in the hope that the condition would improve with time.

(ii) Gradual onset of illness.

(iii) Referral to hospital may only be made when symptoms or behaviour develop to such a degree that patient is unable to carry out normal duties.

TREATMENT.

The treatment of patients admitted to Mill Hill Emergency Hospital can be considered under the following findings :

(i) General therapeutic régime.
(ii) Individual and group therapy.

GENERAL THERAPEUTIC RÉGIME.

Every patient participated in an active régime of occupational and recreational therapy and physical training, together with educational lectures, entertainments and passes out of hospital. This general régime is considered to be at least as important as any other therapeutic measure.

Patients were encouraged to participate in all activities despite their symptoms, to take part in fire-fighting drill, stretcher-bearing, etc., and to have a well-developed sense of social responsibility.

Occupational therapy was as far as possible prescribed individually in accordance with clinical state, attitude, interests, intelligence and service occupation. Emphasis was laid on social obligation in occupational therapy, i.e. part of work was for the hospital or for such outside organizations as day nurseries. Handicrafts, pottery, art, sign-writing and gardening were some of the forms of occupational therapy. In addition to these forms of occupational therapy given at the hospital, some specially selected patients were sent for short courses in book-keeping and typewriting and elementary and mechanical and electrical and engineering courses at Hendon Technical College. These courses had a great therapeutic influence and enabled the instructors to give detailed reports on behaviour, efficiency and suitability for posting or further training in such work. These reports were invaluable in considering postings under the Annexure Scheme.

Physical training was given by Army Physical Training Instructresses, and every effort was made to build up team spirit in opposition to self-centred hypochondriasis.

Individual therapy.—In the background of a general therapeutic régime each patient was considered in respect to her personal needs and problems.

Physical disease was dealt with when present without over-investigation which would tend to induce neurotic attitudes ; no reinforcement of neurotic attitude was allowed.

Physical methods were used in certain cases, e.g. 1 per cent. had continuous narcosis, mainly for acute panic states or agitated depressive states ; modified insulin therapy (1 per cent.) was used mainly for depressed patients who had lost considerable weight, and electroconvulsive therapy for endogenous depressive states.

Psychological methods.—The majority of cases (83 per cent.) were treated by short-term psychotherapy in the form of discussion and re-education. Analytical procedures were used in 1 per cent. Intravenous sodium amytal, cyclonal and pentothal were used for purposes of narco-analysis in about 5 per cent. of cases and found to be valuable as a therapeutic aid for :

(i) Uncovering amnesias or fugues.
(ii) Removal of hysterical symptoms prior to dealing with underlying motives, conflicts, etc.
(iii) To facilitate analytic procedures.
(iv) To aid diagnosis, e.g. sodium amytal by release of muscular tension due to anxiety, revealed true nature of bodily symptoms produced by such tension.

Similarly, hypnosis was often found to be valuable as a preliminary step in therapy.

Group therapy of an educative nature based on elementary anatomy, physiology and psychology to give patients a better understanding of their symptoms and to counteract neurotic and invalid attitudes.

Social work.—A team of psychiatric social workers was available to deal with family or domestic problems when they existed.

In short the treatment was comprehensive and multiple, using as many approaches as were indicated in a given patient, with the aim either of modifying the patient to suit the environment or, failing that, to modify the environment to suit the patient.

PROGNOSIS.

The prognosis in an individual case depended on a large number of factors such as neurotic predisposition, personality make up, attitude to service, degree of social conscience, emotional stability, the degree to which extrinsic causative factors can be modified, suitability of work and ability to effect suitable posting, response to treatment, etc.

The following factors were found to be of *good prognostic significance :*

1. Stable, well-adjusted personality (rather than a specific *type* of personality).
2. Low degree of constitutional predisposition as shown by negative family history, absence of marked neurotic traits in childhood and satisfactory work record.
3. Satisfactory attitude to service.
4. Good social conscience.
5. Precipitation by transient exogenic factors such as febrile illness.
6. Suitability of service work or precipitation by unsuitable work where this could be remedied by Annexure posting.

Poor Prognostic Factors.

1. Unstable, ill-adjusted personality and psychopathy in general.
2. Previous neurosis.
3. Positive family history and childhood neurosis.
4. Hypochondriasis, egocentricity and lack of social conscience.
5. Persistence of marital or domestic stress or other exogenic causative factors which cannot be rectified if patient remains in service.
6. Breakdown occurring under stress of wartime separation and regimentation, i.e. minimal stress.
7. Hysteria as the diagnosis, and an hysterical attitude to symptoms.
8. Prolonged hospitalization for any cause, physical or neurotic.

Disposal.

Category E	50%
Transfer to psychiatric hospital	2%
Posting under Annexure Scheme	13%
Returned to Unit for duty	32%
Returned to duty on other grounds	2%

Half of the patients were considered unsuitable for further service. Many of these patients had improved in hospital, but were considered likely to have an early relapse if returned to military service. Thirty-two per cent. were returned directly to unit and as a rule to their previous work. Thirteen per cent. were specially posted under the Annexure Scheme to work more suitable for their capabilities and residual disability if any.

FOLLOW-UP ON PATIENTS RETURNED TO MILITARY DUTIES.

Follow-up enquiries were made at intervals of 3 months, 6 months, 12 months and 2 years after discharge from hospital.

3 *Months' Follow-up.*

606 were followed up with the following results :

Performing full duties efficiently and willingly	316
,, light ,, ,,	15
Working unsatisfactorily	39
Discharged Category E	104
Deceased	2
No reply	130

Twenty-two per cent. of patients reported on had been discharged Category E, thus bringing the total number of Category E of original group to 28 per cent. Sixty-six per cent. of patients on whom reports were received were stated to be performing full duty efficiently and willingly.

1 *Year Follow-up.*

429 enquiries were sent out with the following results :

Performing full duties efficiently and willingly	254
,, light ,, ,,	6
Working satisfactorily	21
Discharged Category E	70
Deceased	1
No reply	77

Thus, of patients reported upon 75 per cent. were doing full duty efficiently and willingly, and 20 per cent. had been discharged Category E. This raises the proportion of patients discharged Category E to 40 per cent. of the original group of 702 patients.

2 *Years' Follow-up.*

264 patients returned to duty were followed up at intervals for two years. At 3 months, 11·4 per cent. had been discharged Category E. By 6 months

the proportion rose to 25 per cent. Category E discharges. By 1 year the proportion rose to 37·8 per cent. and by 2 years the proportion rose to 51 per cent.

At the end of 2 years approximately 40 per cent. of the original group were reported to be carrying our full duties efficiently and willingly. It is interesting to note that at least 60 per cent. of those eventually discharged Category E had carried out full duties efficiently and willingly for considerable periods before being discharged Category E.

PROPHYLAXIS.

1. *Screening and Selective Posting.*

Our analysis of the neurotic groups indicated that the large majority of patients showed evidence of marked neurotic constitution and were heavily predisposed to develop a neurotic breakdown under stress. It is therefore clear that the best method of prophylaxis is the discovery of the potential neurotic on enlistment. This study has shown that the predisposition to neurosis could have been fairly readily assessed by psychiatric history-taking and examination on enlistment. Shortage of psychiatrists will limit the application of individual psychiatric examinations and it is possible that efficient screening tests will be devised which will enable the potential neurotic to be detected objectively by group methods with a degree of accuracy comparable to that of individual psychiatric examination.

When the potential neurotic is ascertained, two courses are open :

(*a*) Rejection if the individual is deemed unlikely to give useful service in any capacity.

(*b*) Controlling exposure to stress in those individuals showing clear predisposition to neurosis and making the environment as suitable as possible by posting to work of low stress value and in keeping with their temperamental and intellectual capacities.

2. Improving mental hygiene in the Army by education and propaganda with a view to improving morale, increasing a sense of social responsibility and countering egocentric and hypochondriacal tendencies.

3. Education of physicians and surgeons in the principles of psychiatric care and management of patients with physical as well as psychogenic disorders in order to avoid iatrogenic illnesses or psychological invalidism by unwise medical management, over-investigation and unduly prolonged hospitalization.

4. Increased use of group therapy for the potentially neurotic as well as the frank neurotic.

SUMMARY.

1. The article describes the aetiology, form, symptomatology, treatment, prognosis, disposal and follow-up of a group of 2,000 women service neurosis patients admitted to Mill Hill Emergency Hospital, London, during 1942–1944, with special reference to a group of 500 personally treated by the author.

2. A multiplicity of causative factors was found to be the rule. Marked

constitutional predisposition was found in the majority of patients as evidenced by the following indicators of neurotic constitution.

(*a*) Clinically abnormal personality. Only 43 per cent. of the group were judged to have had a well-adjusted and stable previous personality.

(*b*) Neurosis in childhood occurred in 46 per cent.

(*c*) Positive family history for nervous and mental disorder was found in 58 per cent.

(*d*) Previous neurosis and clear predisposition occurred in 40 per cent.

3. Poor intellectual endowment was not an important aetiological factor in the group.

4. Environmental factors of various kinds determine the time of manifestation and degree of severity of the neurotic illness. The following were the main factors: Domestic and marital problems, wartime separation, regimentation and unsuitability of service employment. Infectious illness was a precipitating factor in 8 per cent., and in 5 per cent. only was exposure to enemy action a contributing factor.

5. Various aspects of military life which require special problems of adaptation for women, are considered, and on the whole play an unimportant role in aetiology and only operate in individuals already highly predisposed to neurosis or maladjustment.

6. Motives underlying voluntary enlistment and various attitudes to service life are described and their bearing on the development of neurosis considered.

7. Affective disorder (anxiety and depressive states) was the most common type of illness, accounting for 70 per cent. of the total. Hysteria, mainly conversion in type, occurred in 28 per cent. Other forms of psychiatric disorder were uncommon.

8. Comparison of some 200 items relating to neurosis between a group of 5,300 neurotic soldiers and 2,000 women service patients showed a general similarity in the distribution of the various items. Some features, however, showed a differential sex incidence. The male group showed a higher incidence of anxiety state and somatic manifestation of anxiety, stammer, tremor and longer duration of illness. The female group showed a higher incidence of depressive symptoms, hysterical traits and attitude and sudden onset of illness.

9. The treatment applied was described and included a general therapeutic régime, together with individual and group therapy, including various psychological and physical therapeutic procedures.

10. Factors of good prognostic import were:

(*a*) Stable, well-adjusted personality.

(*b*) Low degree of constitutional predisposition as shown by negative family history, absence of marked neurotic traits in childhood and satisfactory work record.

(*c*) Satisfactory attitude to service and good social sense.

(*d*) Precipitation by exogenic factors, such as febrile illness.

(*e*) Suitability of service work or possibility of posting to more suitable work.

11. Factors of poor prognosis were:

   (*a*) Unstable ill-adjusted personality.
   (*b*) Previous neurosis.
   (*c*) Positive family history.
   (*d*) Hypochondriasis, egocentricity and lack of social conscience.
   (*e*) Breakdown under stress of wartime separation and regimentation (i.e. minimal stress).
   (*f*) Hysteria as the diagnosis and an hysterical attitude to symptoms.
   (*g*) Prolonged hospitalization for any cause.

12. *Disposal.*—Fifty per cent. were discharged Category E. Forty-eight per cent. were returned to duty, either directly (30 per cent.), or by special posting under Annexure Scheme (13 per cent.), or in other groups (2 per cent.).

13. *Follow-up* enquiries were made at intervals up to two years after discharge from hospital. At the end of two years 40 per cent. of the original group were reported to be carrying out full duties efficiently and willingly, and at least 60 per cent. of those eventually invalided from the unit were reported to have carried out full duties efficiently and willingly for considerable periods before being discharged Category E.

14. *Prophylaxis.*—It has been clearly demonstrated that the majority of individuals of the group were heavily predisposed to develop neurosis under stress and that the degree of predisposition could have been readily assessed on enlistment. The most effective preventive psychiatry will be achieved by detecting the potential neurotic on enlistment, and if not rejected for service, the tendency to breakdown can be minimized by posting to work of low stress value and duties in keeping with temperamental and intellectual capacities.

Improvement of Mental Hygiene in the Army by education and propaganda with a view to improving morale and increasing sense of social responsibility; increased use of group therapy for the potential as well as the frank neurotic, and education of physicians and surgeons in principles of psychiatric care and management of patients with physical as well as psychogenic illness are further measures which can greatly contribute to the achievement of effective preventive psychiatry.

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OBSERVATIONS ON FOREIGN-BODY SWALLOWING IN PRISONS.*

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THE swallowing of foreign bodies is more prevalent in prisons than in mental hospitals. Is it that there is something in the prison environment which causes some prisoners to swallow foreign bodies, or should the clue be sought for in the personalities of the swallowers? A few prison swallowers are insane, the great majority are not.

Most of the swallowers I have seen were psychopathic personalities of various types. They had long histories of emotional instability, anti-social propensities and social incapacity. They swallowed, often repeatedly, a variety of foreign bodies, such as knives, forks, spoons, toothbrushes, needles and pieces of metal, glass and razor blades. They did so heedless of the immediate consequences, and with a lack of reflection or appreciation of long-term consequences which is characteristic of the psychopath. It is significant that very few of them swallow foreign bodies when at liberty.

Some swallowers are of a paranoid type. One swallowed the handle of a safety razor which he passed, then a fork and later another fork, both removed surgically. He told me that the swallowing of foreign bodies was "a deliberate plan to cause the prison authorities as much trouble as possible." His ideas were warped and his outlook paranoid. He seriously suggested that the police "manufacture" crime, and said that he felt it his duty to expose a brutal and unjust penal system. To him everything a fellow prisoner did was right, and everything the authorities did was wrong.

Others are of a hysteroid type, the cardinal feature being an emotional instability, and apart from the swallowing there is usually other evidence of a hysteroid personality. They frequently complain of subjective symptoms with no signs of organic disease. The most is made of any minor physical disability in an effort to obtain preferential treatment in prison. A diagnosis of psychopathic personality in one of the Services is regarded as the best excuse for their crimes and for misconduct in prison' They are adepts at self-deception.

Others are the explosive or aggressive type of psychopath, showing as main features an excitable character, unreliability, and anti-social propensities. In prison they show "short circuit" psychopathic reactions of various kinds, and a large proportion of them have convictions for serious crimes of violence.

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* Synopsis of a paper read at the Annual Conference of Prison Medical Officers, 1949. Published with the permission of the Prison Commissioners though it does not necessarily represent their views.

One of these had four operations within a period of four months for the removal of foreign bodies such as forks. He told me that "he could not stand being checked by prison officers." He was selfish and unscrupulous, and had no remorse for his last crime, which was robbery with violence. He wanted money, and to him nothing else mattered at the time.

A few are the inadequate type of psychopath, a social nuisance rather than a danger. One of these swallowed mail-bag needles, and on other occasions inflicted self-injury by inserting needles and other foreign bodies into various parts of his body. He had six operations for their removal. He was below average at school, always in casual work, and never out of prison for more than a few months at a time, usually convicted of theft of bicycles. In prison he was inconsistently euphoric, had a sense of humour, seemed to enjoy being a nuisance, and was childishly contented, lazy, and had no positive qualities of character. He stated that self-injury and swallowing of foreign bodies "always happened on the spur of the moment." Though of low intelligence, he was not feeble-minded.

The reasons given by all types for the swallowing were very varied, and as a rule irrational, illogical and inadequate. Some alleged that they were not being properly treated, some said they wished to cause trouble, and others that they were in debt to other prisoners and unable to pay. In prison the creditor is not expected to press for payment after the debtor has had an operation! Very rarely did a swallower even suggest that he wished to commit suicide, and in fact all of them placed a high value on life, and having swallowed foreign bodies were most anxious to have medical and surgical treatment. From the reasons given it is obvious that conscious motives are not the full explanation, and the swallower is not aware of the true motives. Investigation of these cases was unusually difficult as the men were of only fair intelligence. They were often suspicious, and having given their reasons, expected them to be accepted. Hence the co-operation necessary for anything like a deep psychological investigation was rarely obtained.

However, it was possible to note certain features which most swallowers had in common. There was usually a history of an unhappy early childhood, as seen in one case where the prisoner's father cohabited with a woman by whom he had an epileptic daughter. The daughter was favoured, while the prisoner was beaten by his father whenever the woman complained of him, which was frequently. When old enough the boy ran away from home and has led a criminal life since.

Another common feature was the absence of any real desire to commit suicide, already mentioned.

In my view the unconscious motives behind the conduct of swallowers depend upon feelings of resentment and hostility towards someone in authority or towards an environment which is felt to be oppressive, and such feelings may date back to very early childhood. When such feelings are nourished there is usually a sense of guilt, and at least unconsciously, a sense of guilt provoked desire for punishment. This may partly explain the comparative frequency of foreign body swallowing and self-injury in prisons where authority is much in evidence and the environment is regarded as oppressive. A very simple explanation would be that the swallowing is a form of escapism from unwelcome discipline and work into the more pleasant atmosphere of a hospital, but I think this is very rarely the case. The prison swallower actually lengthens his sentence by forfeiting remission marks when in hospital through his own fault.

In many cases it was not unreasonable to suppose a strong unconscious sense of guilt. One such case was a man brought up in a crowded slum district, with very little parental control. He usually quarrelled with his father, who was cantankerous, and an invalid from war injuries. He had a fair record at school, but from an early age was the leader of a gang of petty thieves. When 19 years old he was convicted of murder but reprieved, and spent 15 years of the life sentence in a convict prison. Twice during that time he was certified insane and spent periods in Broadmoor. Soon after release he was back in prison and swallowed spoons, a knife and fork, and since then has had four operations for swallowed foreign bodies. The reasons he gave for swallowing varied, but a consistent one was that he was not allowed to work where he wanted. He was reluctant to discuss the murder, but agreed that he had no grievance against his victim, whom he says he intended to injure, but not to kill. His attitude was that he " had done time for it and that ended it." He felt that it was harsh to sentence him to death for an offence he had not intended to commit, and he felt hostile towards the police and other officials. He was a man of poorly integrated personality, and it is significant that he twice developed a psychosis *before* he took to swallowing foreign bodies.

All swallowers demand urgent medical attention, and expect the doctor to assume the responsibility that nothing serious happens to them. These attempts to shift the responsibility on to the doctor are very noticeable, and may be an effort to ease the conscience. As far as I was able, I discussed with swallowers their emotional state before and after the swallowing, and I was left with the impression that very few of them were severely depressed at the time. Most of them felt frustrated. They often said they were " fed up " or " browned off." One told me he swallowed when " he was being ordered about and couldn't hit back." I also had the impression that there was as a rule very little premeditation, and very little resistance was put up once they thought of swallowing.

A not unusual type of reaction to guilt feelings which about half the swallowers show is guilt projection in the form of paranoid ideas. Rarely is there much to suggest that the swallower is masochistic.

It may be of interest to give some idea of the amount of crime committed by swallowers. The last twelve under my care had a total of 143 convictions, and the total of the sentences awarded by the Courts was 178 years. Two of the twelve had been certified insane many years ago, and one was certified insane nine months after the swallowing. He twice had a knife removed from the stomach. However, none of the twelve were insane when they swallowed.

In conclusion it may be of interest to summarize the methods of physical treatment. A prison knife is 8 inches, a fork $7\frac{1}{2}$ inches, a spoon 7 inches, and a toothbrush 6 inches, and those who swallowed any of these articles complete needed an operation. I think the prize prison swallower was a man who had 5½ forks and 2 spoons removed at one operation.

When small foreign bodies are swallowed, a diet of bread and porridge, careful examination of all stools and vomit and periodic X-ray examination is all that is usually required, and they are as a rule passed within eight or nine days. The indications for operation are (*a*) perforation indicated by signs of peritonitis, and (*b*) impaction of the foreign body in any part of the alimentary tract. In cases of impaction it was not always easy to decide when to operate. If serial X-rays show that the foreign body has been stationary for two or three weeks I think that operation is indicated even if there are no acute symptoms. It is amazing what can be passed naturally. Within a time limit of three weeks, and in the absence of acute symptoms there is no urgency for surgical interference, and the doctor may safely feel that "They also serve who only stand and wait."

SCHOOL PROBLEMS IN CHILDREN OF AVERAGE OR SUPERIOR INTELLIGENCE: A PRELIMINARY REPORT.

By Anna-Lisa Annell, M.B.

Uppsala.

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I cannot tell whether it is purely a matter of chance that in Uppsala, a university town, I have had to treat difficulties at school in children of average or superior intelligence to a greater extent than in Stockholm where I practised earlier. It is obvious that everywhere the most usual cause of such difficulties is either subnormal intelligence or special difficulties in reading and writing, that can be classed among the aphasic disturbances, most commonly in the form of dyslexia. In Uppsala, however, I have encountered a relatively large number of cases with difficulties of other kinds that are not described, or only mentioned, in current textbooks on child psychiatry.

A transient deterioration in school work during adolescence is very common. The conflicts of puberty are often felt particularly intensely by gifted, intellectually well-differentiated children, although they are often able to overcome these difficulties alone or with slight help.

There is nevertheless a special variant of the problems of adolescence that I have encountered in four or five cases, all boys. Normally there is a period during pre-adolescence, about the age of eleven, when the attitude glides over to the sphere of interests of the other sex; the girls become boyish and the boys slightly girlish. This displacement can sometimes be more pronounced than normally. A typical case-history can then resemble the following:

The patient was an 11-year-old boy. He had always been good and easy to bring up. His work at school was satisfactory, and he had given no cause for anxiety. During the previous months he had changed; he isolated himself from his friends, played truant from school on some days and wandered about the town. Attempts were made to treat him both kindly and severely, but he still continued to play truant.

Examination revealed a physically well-developed boy with no signs or symptoms of note. He was intelligent, and his I.Q. according to the Terman-Merrill tests was 120. Nothing special transpired at first in the course of examination. The boy's way of drawing suddenly gave a clue, since he drew in a way characteristic of a certain type of weak, very womanly girls. This gave a lead, and we therefore sought for other girlish traits. It transpired that he had played with dolls when he was small, and that about six months earlier he had taken them out from their hiding-places in the attic. In addition, he was strikingly interested in housework—not only in cooking, which is very common among boys, but he willingly dusted and cleaned. There was also a number of other symptoms of girlish interests. At school his relations with the other children were disharmonic, since he belonged neither to the boys nor the girls. The days on which he played truant were found to coincide with those on which there were gymnastics. He felt incapable of dressing and undressing and taking a shower after the lesson.

He felt as shy as a girl among boys and was compelled to rush away from the others. There was no doubt that the displacement during pre-adolescence to the side of the other sex was stronger than normally and resulted in the difficulties at school. The conditions were overcome here by, amongst other measures, exempting him from gymnastics.

Another group of children in whom the difficulties are present throughout school life but become more pronounced about the age of eleven or twelve are those of the so-called *sub-valid type.* These children are often physically leptosomatic and asthenic, and show certain mental characteristics of interest in this connection. Their difficulties are associated with the fact that their 24-hour rhythm differs from that of the majority of individuals. This 24-hour rhythm has been the object of a number of investigations made in Sweden by Forsgren and others. The results show that the basic metabolism in man undergoes certain regular variations relatively independent of rest, sleep, administration of food, etc., a definite 24-hour rhythm reflected amongst other ways in the glycogen metabolism in the liver.

This 24-hour rhythm, corresponding to variations in our working capacity and need of rest, has been shown to vary in different types of personality. The two opposite types to some extent are the pyknics, with a cyclothymic character, and the asthenics, whose disposition is cautious, pedantic and conscientious. The former are often relatively sleepy in the evening, fall asleep abruptly and enjoy a deep sleep. They wake relatively early and are soon wide awake and effective. Their working capacity is maximal in the morning while they are still rested. In the middle of the day they are often slightly somnolent, and need a short rest before they can once more work effectively. Towards evening they again become somnolent.

The sub-valid, asthenic individuals are those who only become tired late at night and take some time to fall into a deep sleep. They sleep heavily only towards the morning and wake slowly. Once awake, they are not fully effective until some hours later. Their maximal effectivity is not reached until about 2–3 in the afternoon. This period lasts for some hours, and gradually regresses.

These personality types are also found in children. It is true that the majority belong to a category somewhere between the two, but types as pronounced as those I have described are also found. The latter type, the sub-valids, are usually unsuccessful in the ordinary schools. They are tired and not fully awake on starting school. They have not eaten properly since, they have been too sleepy and their appetite too poor. Even with good intentions they are often unable to do their best during the first hours of the day. They cannot remember their homework although they knew it perfectly the evening before. They appear sluggish and uninterested, even if they really find it easy to study. This type is not so uncommon. It is possible to attempt therapeutic measures such as benzedrine, caffeine or other stimulants which, given in suitable morning doses and under the control of a physician, often give surprisingly good results and are not accompanied by any inconveniences.

It is interesting to note that this type of individual has for long been observed by outstanding physicians. Sir William Osler wrote in the year

1905 in his address to the medical students, "The Student Life" (in *Aequanimitas*, etc.) : ". . . Dr. Savage . . . remarked upon two great groups of patients—those who were depressed in the morning and those who were cheerful, and he suggested that the spirits rose and fell with the bodily temperature—those with very low morning temperatures were depressed, and vice versa. This I believe expresses a truth which may explain the extraordinary difference in the habits of students in this matter of the time at which the best work can be done. Outside of the asylum there are also the two great types, the student-lark who loves to see the sun rise, who comes to breakfast with a cheerful morning face, never so 'fit' as at 6 a.m. We all know the type. What a contrast to the student-owl with his saturnine morning face, thoroughly unhappy, cheated by the wretched breakfast bell of the two best hours of the day for sleep, no appetite, and permeated with an unspeakable hostility to his *vis-à-vis*, whose morning garrulity and good humour are equally offensive. Only gradually, as the day wears on and his temperature rises, does he become endurable to himself and to others, but see him really awake at 10 p.m., while our blithe lark is in hopeless coma over his books, from which it is hard to rouse him sufficiently to get his boots off for bed, our lean owl-friend."

Another group of children who, despite satisfactory intelligence, are unsuccessful at school, are the *ixothymic* or epileptoids. The term ixothymia was introduced by Strömgren in Denmark. The intrinsic meaning of the word is *sticky*. He describes in this way a type of individuals with a general mental rigidity, a tendency to perseveration and difficulties in rapidly changing from one train of thought to another. There is also a slow process of thought, bradyphrenia, traits that we have for long known to characterize the epileptic. Sjöbring (formerly professor of psychiatry in Lund) has elaborated this term. He used the term *ixophrenic* for this type of personality. According to his investigations, this special mental trait is found in 5–10 per cent. of the *adult* population in Sweden. When it is present in such a large number of adults there is evident reason to assume that it can occur in children.

If this picture of symptoms is borne in mind, it can be found occasionally—although scarcely as often as in 5 per cent.—in children with difficulties at home or at school. Despite sufficient intelligence, they are unable to manage their school work, at any rate not to an extent that corresponds to their intellectual level. The explanation is evident : Such children often show more or less pronounced intellectual rigidity, their mind works slowly ; they cannot keep up with their work, and it takes so long a time for them to think out the answer to a question that the teacher thinks that they do not know. It is, however, first and foremost their difficulty in *rapidly* changing from one train of thought to another, in rapidly releasing a mental impression, that gives rise to difficulties.

This retention of mental impressions can be registered objectively in certain cases. We can, for example, make the simple test with a rotating slab with two white and two black sections. At a certain speed of rotation—for example, 300 r.p.m.—the majority of individuals see this slab as evenly grey. The borderlines between the sections are no longer seen. In many of the ixothymic individuals this impression starts at a lower rate of rotation, owing to the fact that the visual picture does not fade so quickly from the consciousness. It has also been found that many such persons interpret the movements on a film as smooth even if, for example, only ten pictures a minute are shown. The majority of other persons notice that such a slow change gives the impression of jerky movements, and prefer approximately 16 pictures per minute in order to interpret the movements as smooth.

The slowing-down of the process of thought and the tendency to retention of mental impressions are accompanied by particular difficulties for the ixothymics. If an attempt is made to force them to think or answer more rapidly than is natural to them, this usually gives rise to an intense disinclination. This is either expressed in an affect-conditioned retardation or arrest of the thought process, or in a general irritation manifested in nervousness, motor uneasiness, etc.

This difficulty in switching from one train of thought to another is also noticeable when changing from one subject to another. Concentrated study is to be recommended for such children.

The schools in Uppsala have become interested in this problem, and have therefore assembled boys with ixothymic traits in one group for concentrated study. When this class was started it was intended to study only two subjects each day, one before lunch and one after. The teacher soon found, however, that it was better to make still fewer changes. They now as a rule study only one subject each week, and therefore have the Sunday on which to rest before dealing with a fresh subject. This arrangement, and the fact that the work now proceeds at a *pace* which suits these pupils and that use made of their often marked visual memory, have resulted in good achievements in pupils who were earlier unable to follow the curriculum despite satisfactory intelligence.

These ixothymic children very closely resemble the epileptics in many respects, although they have had no epileptic seizures. All degrees of intelligence are represented. A not inconsiderable number show a pathological EEG of the type characteristic of epilepsy. In the Rorschach test there are often many epileptic traits, and in drawing and painting they often have a tendency to work in colour and not in form, typical of many epileptics. Relatively many also show slight motor or neurological deviations from the normal. This indicates that, at least in some of them, there is presumably a traumatic, organic basis to the symptomatology.

This brings me to another group of disturbances in children. These are motor dysfunctions occurring in children with otherwise good intelligence. These dysfunctions involve particular difficulties at school, and prevent normal play and association with other children. They must be interpreted as objective symptoms of an organic immaturity or of cerebral lesions.

In many quarters there is a tendency to consider nervous symptoms and behaviour disturbances in children as a result *only* of environmental injuries of various kinds. Tremendous energy is then devoted to tracing even very subtle mental traumata. It is difficult to believe that this is the whole truth. An entirely healthy child has an unbelievable adaptability. It can tolerate even severe mental stress and evident environmental injuries without developing neurotic symptoms. The nervous system of the child can, however, lack the normal power of adaptation. This can be due to constitutional anomalies, such as immaturity, disturbances in the internal secretions, or sequelae of organic diseases such as slight encephalitis following a disease of childhood—for example, whooping-cough or measles. Then even relatively moderate mental strain will lead to nervous symptoms or behaviour disturbances of a severe nature. This statement obviously implies no depreciation of the importance of tracing the psychological reasons for the symptoms and of suitable psychotherapy. It is nevertheless of fundamental importance to bear this dual reason for the symptoms in mind.

Deviations from the normal motor development of the child are of great value as signs of the presence of such organic exciting factors. I found that of approximately 600 patients between the age of 6 and 17 in the ward or out-patient of the Department of Child Psychiatry in Uppsala, motor dysfunction was present in 78 cases. I have not included such gross organic lesions that have given rise to paralyses or spasticity, or such poor motor development in mental defectives that was proportional to their degree of mental retardation.

Table I shows the distribution of the material as regards the I.Q., age and schooling. Twenty-one of the cases are of inferior intellect with an I.Q. below 90, 31 are of medium intellect with an I.Q. of 90–109, and 26 can be said to have superior intelligence with an I.Q. over 110. The tests were made with the Terman-Merrill method. It should be borne in mind that the tests also include those in which motor function plays a role, thus giving poorer results. The purely theoretical, formal functions of the intellect are therefore, on the average, higher than is shown by these figures.

TABLE I.—*Distribution According to I.Q., Age, and Schooling.*

I.Q.	School.												Total.	
	Primary. 6–8 years.		Elementary. 9–14 years.		Secondary.				Not started. 6–7 years.		Finished. 15–17 years.			
					9–14 years.		15–17 years.							
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
60–69	..	1	..	1	..	..	..	..	1	2	..	..	1	4
70–79	2	1	4	1	..	..	..	..	..	..	1	1	7	3
80–89	3	..	3	..	..	..	..	..	..	..	..	..	6	..
90–99	2	..	6	1	..	1	..	..	1	..	..	..	9	2
100–109	6	..	7	1	..	2	..	1	2	..	..	..	15	5
110–119	2	..	3	..	2	1	..	..	..	..	..	..	7	1
120–129	..	..	5	2	1	..	2	..	..	..	..	..	7	2
130–139	1	..	..	..	4	..	..	..	1	..	..	..	6	..
140–160	..	..	..	..	3	..	..	..	..	..	..	..	3	..
Total	16	2	28	6	10	4	2	1	5	2	1	1	61	17
													78	

It has been found that certain types or combinations of symptoms that occur at times can be distinguished among these children with poor motor function, particularly in respect of the finer motor functions. Such a classification of the cases has been attempted in Table II. More details regarding my definitions and a description of some typical cases follow. The first six groups, comprising 62 cases, are such that there is a probable organic aetiology in the form of general immaturity, internal secretory disturbances, organic cerebral lesions. In the five cases classified as neuroses, there are definite mental exciting factors.

TABLE II.—*Distribution According to Type of Motor Dysfunction.*

Type.	I.Q. < 90.		90–99.		100–109.		110–119.		120–129.		> 130.		Total.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Motor infantilism	8	4	1	..	3	..	2	..	1	..	2	..	17	4
Neurolability	..	1	..	..	1	1	..	..	1	..	1	..	3	2
Obesity and ophthalmic symptoms	..	..	2	1	2	1	1	..	1	..	2	..	8	2
Asthenia	..	..	1	..	2	..	1	..	..	..	..	..	4	..
Ixoidia	3	1	1	1	2	..	..	..	..	1	..	..	6	3
Aphasia or dyslexia	1	1	1	..	3	1	1	1	2	..	2	..	10	3
Neurosis	2	..	..	..	1	..	..	..	1	1	..	..	4	1
Miscellaneous	..	..	3	..	1	2	2	..	1	..	2	..	9	2
Total	14	7	9	2	15	5	7	1	7	2	9	..	61	17

1. The first group—motor infantilism—corresponds fairly well to the complex of symptoms described under this term by Homburger in his *Psychopatologie d. Kindesalters*. He nevertheless describes this symptom as occurring mainly in mental defectives. It is certainly most common in our material among those of inferior intellect. Twelve of the 21 cases of this type have an I.Q. below 90. This type occurs, however, in all grades of intelligence. The following is a short account of one of my patients with a superior intellect, an 8-year-old boy with an I.Q. of 135.

He was sent to me owing to his absolutely undisciplined behaviour at school. He sometimes kept quiet during reading, but if there was writing or drawing, he left his seat, jumped about on the floor or out of the window. He sometimes sat down again suddenly and began to tell stories—of which he had an inexhaustible fund—aloud to the other pupils.

Both parents are university graduates, the father an assistant professor. There was nothing of interest in the hereditary history, and nothing of note during the mother's pregnancy or labour or during the early childhood of the patient. He started to walk at the age of 13 months and to talk at 18 months. He talked clearly and in well-formulated sentences almost at once. He suffered from enuresis until the age of 4. He has always been left-handed. He learnt to dress himself late and still dresses slowly, finding it difficult to do up buttons,and cannot tie his shoe-laces without their coming undone. He has not wanted to learn to ride a bicycle or to skate. Started school at the age of six and is now in the second class. He reads a tremendous amount, children's books and grown-up books, encyclopaedias and textbooks. He cannot write, but only prints, and draws very badly. Physically the child is of normal size, somewhat slender. His patellary reflexes are brisk, and in the Babinski test his toes spread out in a fan-shape. When he is asleep he stretches his arms above his head like an infant. Sometimes he makes athetoid accessory movements with his fingers, particularly in movements of precision. His gait is slightly wide-stepped like that of a small child. He is very uncertain when he makes movements without visual control. His speech corresponds to the development in a 14–15-year-old, with a large vocabulary and excellent construction of the sentences. His understanding even of abstract terms and definitions is very distinct. It can be mentioned as a curiosity that his EEG resembled that of an adult.

Briefly, this 8-year-old boy had the physical development of an 8-year-old, the speech development of a 14-year-old and the motor development of a 5-year-old. In his class at school he is in some respects far ahead of his classmates, but as regards motor activities he is far behind them and has no normal contact with them. He tries, when such subjects are studied in school in which his motor retardation is apparent, to compensate his weakness by clowning or by distracting interest from the work he is to do. The only possible treatment is presumably individual instruction. If the boy can be helped in the immediate future the prognosis should be fairly good, since motor infantilism has a tendency to improvement, a spontaneous maturity usually occurring.

2. Motor disturbances combined with neurolability are relatively close to motor infantilism. In Sweden the neurolabile type of child has been described in particular by Professor Arvid Wallgren, the paediatrician. He assigns to this group those physically and mentally sensitive children who are very susceptible to infections, are often allergic and, mentally, also show certain signs of a general nervous hypersensitivity. These cases very much resemble those of motor infantilism.

3. There is a certain type of motorially underdeveloped children with relative adiposity and ophthalmic symptoms that can be recognized almost immediately they enter the room. Such children are somewhat overweight, have short, broad hands and feet, and resemble to some extent children suffering from adiposogenital dystrophy. Their faces are round and the external genitalia somewhat small. They have often suffered from strabismus, and wear glasses owing to anomalies of refraction. Their movements are slightly slow, and their temperament seems to be sluggish and philosophical. Gymnastics are often a torment for them. They make many mistakes in dictation owing to their slow pace of work, but far fewer when they write compositions. In several cases similar symptoms have been present in other members of the family. The following is a typical case :

A boy, aged 14, with an I.Q. of 139, had during the past year the lowest marks in all written subjects and gymnastics, low marks for conduct since, amongst other things, his exercise books were always so full of ink-blots, etc., that it was considered due to carelessness. He showed an intense dislike of school and wanted to be a farmer. His paternal grandfather had been obese and had suffered from diabetes in old age. He was considered to be very gifted and was a member of the Riksdag, but had always hated schools and believed that they ruined children. He failed to complete the course at an elementary school and always allowed his wife to write his letters, etc. Otherwise there was nothing of interest in the hereditary history. The boy started to walk at 18 months and to talk at 8 months, but could not speak clearly until he was 5 or 6 years old. He was late in learning to dress himself and had always been very slow, thorough and circumstantial. He was given a bicycle when he started school at the age of seven, but waited a year before he learnt to ride it.

Examination showed that, physically, the appearance of the boy was typical of this group. He was slightly overweight, there was a suggestion of a feminine distribution of the fat, his hands and feet were short and broad, and his external genital organs small. He was astigmatic and wore glasses. His movements were slow, he wrote slowly and unevenly, and did up buttons slowly. He found it difficult to carry out any movements that could not be controlled visually,and could not walk along a straight line on the floor with his eyes shut. His EEG was pathological with general dysrhythmia and a focus in the left occipital region.

All the ten cases of this type that I have seen have been so alike physically, and to a certain extent mentally, that they might have been siblings.

4. The asthenic type appears, physically, to be the opposite of the foregoing. Such children have always been tall, slight and thin with long arms and legs and have poor muscles, bad posture, and are often round-shouldered. They are easily fatigued. They must often be helped with dressing even after they have started school, and show the same dislike of games, gymnastics and bodily movement as the former group. Both this group and the third give the absolute impression that there is some connection with an internal secretory disturbance.

5. Those children who have shown simultaneous motor difficulties and ixoid mental traits have usually, in addition to actual difficulties at school, given anxiety owing to their peculiarities of temper. They do not form a homogeneous group as regards physical signs and symptoms. Many of them have shown unevenness as regards the strength of the reflexes on either side, and in some there is a suggestion of spasticity in one arm or leg. On the whole the symptoms in this group appear to be conditioned by lesions. It will be shown in the following that there are notes in the case-histories of six of the nine cases of diseases or other factors that can be thought to be the direct cause of such injury.

6. In the group in which the motor symptoms appear in conjunction with symptoms of aphasic disturbances, the case-history nearly always contains a note of late speech development. In addition to a number of motor difficulties—difficulties in doing up buttons, threading needles, eating without spilling—there is also throughout a poor speech development. It appears as if left-handedness were more common in this group than in the others. Nevertheless, left-handedness or lack of pronounced right-handedness occurs in more than half the material I have gone through.

7. The occurrence of motor disturbances on psychogenic grounds is indisputable, mainly in the form of increased muscular tension that can even give rise to a gait and movements resembling those of a spastic child. In such instances the case-history differs from that of the other groups. There is often no note of retarded motor development in early childhood, and very considerable disparity in the motor achievements is often present.

TABLE III.—*Possible Causes of the Motor Dysfunctions.*

	Infantilism.	Neurolability.	Obesity ophthalmic symptoms.	Asthenia.	Ixoidia.	Aphasia, dyslexia.	Neurosis.	Miscellaneous.	Total.
Familial inheritance	..	..	4	..	1	3	..	..	8
Foetal injury	1	..	..	..	..	1	..	..	2
Prematurity	2	..	..	1	..	2	..	..	5
Birth injury	2	..	1	..	1	..	1	..	5
Head injury	1	..	1	..	..	..	..	..	2
Whooping-cough before 18 months	2	..	..	..	2	2	..	1	7
Other infectious disease	2	2	..	..	1	1	1	..	7
Encephalitis	..	..	..	..	1	1	..	..	2
Total	10	2	6	1	6	10	2	1	38

The foregoing is a brief attempt to classify these cases of motor dysfunction according to their symptoms. I have also endeavoured to stress such factors in the case-history as could be thought to be the cause of these deviations from the normal as regards motor development. A preliminary collocation is found in Table III, which is a survey of the possible organic aetiological factors. These could be demonstrated in 32 of the 78 cases. In three or four cases there were several of these factors in one and the same patient—for example, prematurity and whooping-cough in early childhood.

The pictures of symptoms that I have described illustrate graphically how important it is for such problems to be investigated and judged by doctors. In certain quarters in Sweden there is a tendency to entrust problems of child psychology and school problems of various kinds to a great extent to pyschologists without medical training—school psychologists, educationists, social psychologists and others. Such a development would undoubtedly be extremely unfortunate. Increased experience in the fields of child psychology and psychiatry will presumably show that one complex of symptoms after the other is not only mentally conditioned but also has a physical cause. If we are to understand these cases correctly and are to build up a suitable scheme of treatment and prophylactic measures, it is vital that neither one nor the other of these aspects should be disregarded.

THE TREATMENT OF MENTAL DEFECTIVES WITH THIAMINE.

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Thiamine or aneurine has for many years been known as the anti-neuritic vitamin, although action of this substance in organic nervous trouble is not established. Less well-known is its action on the higher cerebral processes, but results of investigations appear to show that it has a definite effect on these. M. V. Dias (1947) found that the application of thiamine hydrochloride solution to the motor cortex of unanaesthetized dogs produced clonic contractions of the appropriate muscles, and Harrell (1946) reports striking psychological results on normal children.

Other Substances.

Substances other than thiamine have been used in attempts to improve the mental processes, amphetamine sulphate having been used by several workers. Using Cattell's equivalent A and B forms of Scale 2, Sargant and Blackburn (1936) found that 10 cases showed an increase of at least 10 points from 1½ to 2½ hours after the ingestion of the preparation. Of their cases, 38 were instances of anxiety, depression or hysteria, these showing an average gain of 4·63 points, and 8 were schizophrenics who showed an average gain of 2·37 points.

Molitch and Sullivan (1937) gave amphetamine to normal boys aged from 10 to 17 years and found that a higher percentage of improvement took place in those given 20 mgm. than in those given one half of this amount. The unit of measurement was the place in form based on knowledge, the Stanford achievement test being used.

Doses of 20 mgm. to most and of 10 mgm. to a few were used by Bradley and Green (1940) on 21 children, ranging from 9 to 13 years of age. The I.Q.'s of 13 of these varied from 90 to 110. No significant changes were found in these quotients, the revised Stanford Revision, Forms L and M being used. These last results are probably the correct findings, for these authors point out that improved performance is not due to increase of the I.Q. but to an improvement in the attention and energy, and to decrease of fatigue. Amphetamine improves the inclination, not the ability.

Glutamic acid has been found to activate brain substances, Weil-Malherbe reporting that l (+) glutamic acid is the only amino-acid known to be metabolized by slices of this tissue.

Nachmansohn and Machado (1943) isolated an enzyme from the brain which synthesized acetylcholine, but which became inactive on dialysis. Nachmansohn, John and Waelsch (1943) found that it was reactivated by the addition of l (+) glutamic acid.

Zimmerman and Ross (1944) found that, using white rats, the number of trials for learning a maze were less than half in the rats fed upon this acid than amongst the controls. Time and accuracy scores were also significantly greater.

"A universally increased mental and physical alertness" was observed by Price, Waelsch and Putnam (1943) during the treatment of epileptics with *dl*-glutamic acid hydrochloride, but these authors were unable to correlate the incidence of seizures with the degree of improvement in mental efficiency.

A study of the effect of l (+) glutamic acid on the mental functioning of 69 subjects, from 16 months to 17½ years in age, has been made by Zimmerman, Burgomeister and Putnan (1946). The I.Q.'s varied from 30 to 131 before treatment, the revised Stanford Revision, Form L, the Wechsler-Bellevue, the Kuhlman-Binet, the Merrill-Palmer and the Arthur point scale being used before and after treatment. In addition, 48 cases were given the Rorschach test. Of the 69 cases, 28 suffered from convulsions, 11 of these being mentally retarded. A total of 44 mentally retarded cases was used.

The glutamic acid was given for six months, the dose being gradually raised until increased motor activity was present, or until distractability and non-co-operation occurred. The dose was then slightly reduced. Its range was from 6 to 24 gm. daily, the majority of patients being given from 12 to 24 gm. divided into three doses. The average increase of mental age after the administration of the l (+) glutamic acid for 6 months on the Stanford-Binet test was one year and one month and for performance tests was one year exactly. These increases represent double the increase expected in normal individuals over a 6-month period. The average I.Q.'s rose by 6·31 in the first type of test and by 7·00 in the second. Of the 516 changes in retest it ms of the Stanford-Binet tests, 90 per cent. were additions, only 10 per cent. being failures at tests passed before the administration of the glutamic acid.

The Rorschach results also showed a gain. Consistent improvement in form level, a marked reduction in inaccuracies of description and a greater facility for observing details were noted. Popular responses increased by 6 per cent. These results suggest that better social and emotional adjustment is produced by glutamic acid. This is confirmed by the clinical descriptions given by the authors.

Consideration of the permanence of the effects of glutamic acid is not dealt with, but from the description of Case 1, in whom the dose of the acid was temporarily reduced, and of Case 8 in the preliminary report of Zimmerman, Burgomeister and Putnam (1946), it is clear that when the acid is discontinued the mental state returns to its former level, a definite deterioration in behaviour and interest being noted over a period of one month in each case.

A further report, after one year's treatment, showed that the degree of improvement and the proportion of cases improving were less in the second six months than in the first. For instance, in 97 per cent. of the cases, the second I.Q. was greater than the first, but in only 53 per cent. was the third greater than the second. With regard to mental age, an average gain of 8·67 points took place during the first six months, but only 2·20 points during the second. The authors (1948) consider that a ceiling effect occurs with glutamic acid.

Use of Thiamine on Normal Children.

The reduction of improved mental functioning does not appear to occur in all tests when thiamine is used in place of l (+) glutamic acid. As already mentioned, the use of thiamine has been extensively investigated by Harrell, who used 110 normal individuals aged 4–20 years, most of them being from 9–19 years of age. The subjects were kept under standard conditions in an orphans' home, both the controls and those receiving the 2 mgm. additional thiamine being given indistinguishable tablets. Examination of the standard dietary was made, the thiamine intake being estimated on two days at 0·9 and 1·0 mgm. daily per case. These quantities are less than the quantity of Vitamin B1 recommended by the Food and Nutrition Board of the National Research Council, U.S.A., in 1945, the quantities advised being 1·2 mgm. for children of from 10 to 12 years of age, and up to a maximum of 2 mgm. daily for adults, the latter quantity being less in inactive individuals.

Harrell conducted a preliminary six weeks' trial with thiamine, 18 tests being performed nine times each before the administration of the preparation. During the period of six weeks the 18 test tasks were practiced eight times each. The subjects receiving the thiamine surpassed the control group in average gain in every task, the total increase averaging 27 per cent. for the combined 18 tasks, the various increases being from 7 to 87 per cent. The nature of the tasks is exemplified by the following: Underlining, code learning, reading, division, addition, multiplication, subtraction, arithmetical problems, number span, throwing ten darts, completion of geometric designs, hand-grip, throwing ten baseballs into a pocket. Although, statistically, the assumption could be made that the superiorities could have been due to chance, all changes were on the positive side for the thiamine-fed group.

The second experiment lasted for one year and again, in various tests, the subjects receiving the thiamine showed a superiority over the controls. The nature of the tests is exemplified by the following list: Visual acuity, height, weight, remembering word pairs, code substitution, memorizing, remembering morse code, intelligence tests, reading, vocabulary, reaction-time, educational achievement. With the controls' increases 100 units, the test subjects gave rises from 113 units (weight) to 3,200 units (visual acuity—Snellen). Reading showed an increase to 2,800 units and memorizing to 533 units. Height and reaction time increased little, height to 120 units, and reaction time to 118 units.

During a second year, one quarter of the subjects who had received thiamine during the first year received the placebo and one quarter of those who had received the placebo received thiamine. The vitamin subjects gained an average of 15 per cent. in performance in the first year as against 10 per cent. in the control group, whilst, in the second year, the figures were 22 per cent. and 15 per cent. respectively.

During a third year, pairs of individuals were again reversed without their knowledge, so that those thiamine-fed received a placebo, and those placebo-fed received thiamine. The unreversed thiamine-fed cases continued to show superiority in all 11 tests, but the reversed ones, although not receiving thiamine, showed no adverse effects of the withdrawal in intelligence tests, educational achievement, reaction time, weight or height. The improvement in these measurements continued after the cessation of the thiamine.

USE OF THIAMINE ON MENTAL DEFECTIVES.

In view of the persistence of improvement in intelligence tests after the cessation of the administration in normal children, an investigation of the effect of the vitamin upon mental defectives has been undertaken.

(1) *Selection of Cases and Dosage.*

The entire population, numbering 687 persons of all grades, of all ages and of both sexes, of a mental deficiency colony was examined. All cases who had shown no improvement in behaviour, either in their lodges, at school or at work, were given 3 mgm. thiamine once daily. This dose was 1 mgm. greater than that used by Harrell in order to ensure that the total quantity of thiamine ingested daily was at least equal to that given by this worker. In addition, the possibility existed that mental defectives might require a greater quantity than would average individuals in order to show an equal improvement.

Mental deficiency is a social concept, behaviour being of paramount importance in consideration of fitness for normal life. In this investigation three social aspects have been noted, the general behaviour in the lodges, the progress at school or work, and the social age as measured by Doll's social maturity test. In addition, the I.Q. was compared before and after treatment, the same test being used on each occasion in the same case. For cases with chronological ages of more than 14 years and with I.Q.'s of 50 or more, the Wechsler-Bellevue (verbal) test was used. The Merrill-Palmer test and the Stanford Revision of the Binet test were used on the remainder.

At the colony at which this investigation was undertaken, the nurse in charge of each lodge writes a routine yearly report upon each case. These reports were used to determine that the defectives were not improving. No case was given thiamine if any doubt existed, however slight, that any improvement had taken place during the twelve months preceding the commencement of the thiamine. The cases had been admitted to the colony from 3 to 17 years before the beginning of the investigation, so that the maximum improvement due to discipline, habit training and colony régime had already taken place. No defective was included in the series if the S.A., obtained on two occasions at six-monthly intervals over a period of one year, showed a rise, however slight.

The total number of defectives who had shown no improvement and who subsequently received the thiamine in doses of 3 mgm. once daily for a period of from 5 to 6 months, was 90, 55 being males and 35 being females. The dose used appears to be the maximum advisable, as even with this relatively low dose, the necessity arose in three cases to terminate the treatment within three months owing to increased excitability. In one man, destructiveness increased, in another noisiness increased, whilst the third became more violent-tempered. In addition, one female and one male became over-excitable and hot-tempered, but insufficiently so to necessitate cessation of the thiamine.

At the commencement of the treatment the males varied from $6\frac{11}{12}$ years to $50\frac{9}{12}$ years and the females from $4\frac{11}{12}$ years to $52\frac{5}{12}$ years in age, the distribution being shown in Table I.

TABLE I.—*Chronological Ages of Cases before Thiamine.*

Years.	M.	F.
0	7	7
10	25	10
20	11	5
30	9	8
40	2	4
50	1	1
Total	55	35

Idiots, imbeciles and feeble-minded were included in each sex, the intelligence quotient ranging from 0 to 88 in the males, and from 0 to 90 in the females (Table V).

(2) *Results.*

The results may be described in four groups :

(*a*) Behaviour in lodges.
(*b*) Work or school reports.
(*c*) Social age.
(*d*) Intelligence quotients.

(*a*) Of the 90 cases, 12 showed improvement, 5 of these being termed slight. The stationary cases numbered 73, and 5 deteriorated in behaviour. These figures exclude the 3 cases already mentioned whose behaviour deteriorated to such a degree that the thiamine was stopped before the termination of the experimental period of from 5 to 6 months.

(*b*) Of 65 cases who attended school or work, 10 showed improvement, 5 of these being reported as showing a slight change only. Those remaining stationary numbered 52 and 3 deteriorated at their school or work. The remainder were too low-grade to attend either school or work.

(*c*) The results of testing and retesting are not precisely constant. Consequently a comparison of the S.A. immediately before the commencement of the thiamine with that after its ingestion for 5 or 6 months may not be accurate. The S.A. of the cases in this investigation were estimated at least twice, at six-monthly intervals, preceding the beginning of the administration of the thiamine. Although the S.A. after the cessation of the thiamine was frequently greater than that estimated immediately previous to the commencement of the preparation, if it was not higher than each of the preceding S.A.'s, it could not be termed a true increase. True increases have, therefore, been taken to be S.A.'s greater after the cessation of the thiamine than any of those before its commencement. True increases numbered 21 in a total of 90 cases, and varied from 0·2 to 2·3 years. Of 18 defectives showing a decrease of S.A. after the administration of the thiamine, 10 showed a decrease before the commencement of the preparation and this decrease continued during its administration. Of 37 cases who showed the same S.A. in the two estimates preceding the thiamine, 7 showed a decrease after the administration of the preparation. Cases numbering 14 remained stationary in the two estimates before the thiamine and in that after. Of the 37 cases stationary preceding the thiamine, 16 increased, and 14 remained stationary in S.A.

TABLE II.—*Number of Cases at each S.A. before and after Thiamine.*

S.A.	Before.			After.		
	M.	F.	Total.	M.	F.	Total.
0	14	8	22	13	9	22
1	13	7	20	13	6	19
2	4	2	6	4	1	5
3	5	0	5	4	1	5
4	5	3	8	6	1	7
5	3	2	5	3	4	7
6	3	6	9	2	4	6
7	2	3	5	1	6	7
8	3	2	5	7	1	8
9	2	2	4	0	2	2
10	1	0	1	1	0	1
11	0	0	0	1	0	1
	55	35	90	55	35	90

TABLE III.—*Number of Cases Showing Changes in S.A. after Thiamine.*

	Raised.	Stationary.	Decreased.	Total.
Female	13	11	11	35
Male	23	25	7	55
	36	36	18	90

TABLE IV.—*Number of Cases Showing Changes after Thiamine in S.A.'s Stationary Previously.*

	Raised.	Stationary.	Decreased.	Total.
Female	4	3	2	9
Male	12	11	5	28
	16	14	7	37

(*d*) Variation in I.Q.'s after thiamine is shown in Tables V and VI. In the latter the two sexes are combined. In this table the cases who were too low-grade to score any points on the Merrill-Palmer scale are omitted. The number of units of increase varied from 1 to 20.

TABLE V.—*Number of Cases at each Intelligence Quotient before and after Thiamine.*

I.Q.	Before.			After.		
	M.	F.	Total.	M.	F.	Total.
0	18	12	30	20	12	32
1	2	0	2	3	1	4
20	5	2	7	6	4	10
30	4	9	13	4	5	9
40	8	6	14	5	7	12
50	5	4	9	6	2	8
60	5	0	5	5	2	7
70	2	0	2	2	0	2
80	4	0	4	1	1	2
90	0	1	1	0	0	0
100	0	0	0	1	0	1
Totals	53*	34†	87	53	34	87

* No I.Q. in two cases. † No I.Q. in one case.

TABLE VI.—*Variation in I.Q.*

Test.	Raised.	Stationary.	Fell.*	Total.
Merrill-Palmer	3	3	10	16
Stanford Revision	6	3	16	25
Wechsler (Verbal)	8	5	3	16

* Inclusive of falls due to normal average yearly decrease.

DISCUSSION.

(*a*) *General remarks.*—The individuals who showed improvement in one form or another are shown in Table VII.

TABLE VII.—*Cases who Showed Improvement after Thiamine.*

Case No.	Improved in.				Before treatment.	
	Lodge.	Work.	S.A.	I.Q.	Ch. age.	S.A.
8	+	0	—	—	7	0·4
10	+	0	—	—	7	0·6
12	+	0	—	—	11	0·2
16	+	0	—	—	5	0·4
20	+	0	—	—	8	0·9
25	—	—	+	—	12	1·3

TABLE VII—*continued.*

Case No.	Improved in.					Before treatment.	
	Lodge.	Work.	S.A.	I.Q.		Ch. age.	S.A.
27	−	−	+	−		11	1·3
28	−	0	+	−		12	1·3
29	−	0	+	−		12	0·94
33	−	−	+	−		9	3·6
35	−	+	−	−		13	8·6
36	−	+	+	−		7	3·0
39	−	+	−	−		11	5·1
40	−	−	+	−		17	4·0
41	−	−	+	−		31	3·5
42	+	+	+	−		25	1·9
44	−	−	−	+		22	5·8
45	−	−	+	−		33	2·6
46	−	−	+	−		26	4·2
47	−	−	−	+		30	4·5
48	+	+	−	−		26	7·2
49	−	−	+	−		17	6·8
50	−	−	+	+		35	10·8
51	+	+	−	0		47	3·0
52	−	−	+	+		23	5·8
55	−	−	−	+		36	1·5
56	−	−	+	0		17	1·8
60	−	−	−	+		28	2·1
61	−	−	−	+		45	7·2
62	+	+	−	−		36	7·8
63	−	−	+	−		29	9·7
65	−	−	−	+		38	8·0
66	+	+	−	+		19	7·6
68	−	−	+	+		11	2·9
73	−	0	−	+		17	1·8
74	−	−	+	+		13	4·3
76	−	+	−	+		41	9·0
77	−	−	+	−		38	6·3
79	−	−	+	−		37	5·8
80	+	−	−	−		44	5·0
86	−	−	−	+		31	8·5
87	+	+	+	+		25	7·6
88	−	−	−	+		21	6·8
90	−	0	−	+		25	7·8
44	12	10	21	17	Totals		

+ = Improvement. — = No improvement. 0 = No school, work or test. Chronological ages to the nearest year.

This table shows that a few cases improved in more than one quality. Number 36 improved in work and S.A., No. 76 improved in work and I.Q., Nos. 50, 52, 68 and 74 improved in S.A. and in I.Q., Nos. 48, 51 and 62 improved in lodge and work, No. 66 improved in lodge, work and I.Q., No. 42 in lodge, work and S.A., and No. 87 in lodge, work, S.A. and I.Q.

The degree of improvement was seldom great, but as the cases had been in the Colony for periods varying from 3 to 17 years and had shown no improvement for a minimum period of one year before the commencement of the thiamine, any improvement, even if slight, is of interest. A slight improvement every six months will, if continued over a few years, become a considerable alteration.

Details of the improvements in lodges and at work are as follows :

Cases 8, 10, 12 and 16 take more interest in their general surroundings and Case 20, in addition, a greater interest in other children.

Case 35 has improved in reading, Case 36 in talking, and also he takes a greater interest in Montessori apparatus. Case 39 has improved in both reading and arithmetic.

Case 42 shows a general improvement in behaviour. He is more contented and less noisy. He takes a greater interest in his surroundings and talks more. He has improved slightly at work.

Case 48 is also more contented, less boisterous, and his hot tempers are becoming fewer. A general improvement has taken place in his behaviour. A slight improvement at work has been noted.

Case 51 is brighter and more alert. He is more friendly with other patients, now works at domestic occupations without being prompted, and shows no violent outbursts.

Case 62 is more cheerful and brighter. He mixes more with others in conversation and games and is more active. Whereas, previously, he was lazy, he now works hard and well.

Case 66 is now alert, active and more able to grasp instructions. He was unable to read or write, but is now eager to learn and copies written matter on bags or boxes in the general stores where he works more efficiently.

Case 76 is working more satisfactorily and is more willing to help, whilst Cases 80 and 87 are more stable in their general behaviour, the second having also improved in her work.

(*b*) *Chronological age.*—Those who improved in their lodges varied from 5 to 47 years of age, those who improved at school or work from 7 to 36 years of age, those who showed rises of S.A. from 7 to 38 years of age, and those who showed rises of I.Q. from 11 to 41 years of age. It is clear that both children and adults showed improvement.

(*c*) *Social age.*—The pre-treatment S.A.'s of those who improved varied from 0·2 to 6·8 amongst those who improved in the lodges, from 1·9 to 8·6 amongst those who improved at school or work, from 0·94 to 10·8 in those who showed a true rise of S.A., and from 1·5 to 10·8 in those who showed a rise of I.Q. Although improvements occurred amongst all levels of S.A., they were less common amongst those with S.A. below 1·0 than amongst those above this level.

SUMMARY.

A series of 90 certified mental defectives of both sexes, all ages and all grades, were given orally 3 mgm. thiamine once daily for 5 to 6 months.

All cases had shown no improvement in their behaviour in their lodges, in their school or work, or in their social ages for at least one year prior to the commencement of the administration of the thiamine.

The cases were in a colony for mental defectives and had been in this colony for periods varying from 3 to 17 years.

The behaviour of 5 cases became more violent or destructive. In 3 of these cases the necessity arose to stop the treatment after 3 months had passed. These 3 are excluded from this discussion.

Of the 90 cases who received the full course, 44 showed improvement in one or more of the following: (*a*) Behaviour in lodge, (*b*) work or school, (*c*) social age, (*d*) intelligence quotient.

Further observation of these improvements is required in order to determine whether they are permanent, and, perhaps, progressive in nature.

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THE TREATMENT OF DEPRESSION WITH DESOXYEPHEDRINE (METHEDRINE)

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The treatment of depression with desoxyephedrine (pervitin or methedrine) is not new. In 1943 Davidoff reported a comparison of the effect of this preparation with amphetamine and dextroamphetamine on 8 normal and 8 depressed individuals. He found that desoxyephedrine gave the most rapid results, acted the longest and produced the greatest motor activity the most often.

Golla, Blackburn and Graham recorded in 1940 that, although they found no difference between the effects of the two preparations in carefully arranged tests, the effect of 10 mgm. of amphetamine sulphate in 2 individuals was equal to that of half this quantity of desoxyephedrine. Cuthbertson and Knox, in 1947, reported that on fatigued soldiers methedrine was 1½ times as strong as amphetamine.

In view of these reports a series of cases of depression has been treated with desoxyephedrine in an attempt to determine whether the preparation can, in even a few instances, take the place of electric-convulsion therapy. If an equally effective and safe alternative to the severe and often uncomfortable E.C.T. could be found, the advantage to the patient would be obvious.

Type of Cases.

A total of 42 cases was treated; 33 of these were female and 9 were male. All the men were treated as out-patients whilst living in their homes. Of the women, 28 were in-patients in a nursing home. The ages of the cases ranged from 24 to 89 years, the distribution being shown in Table I.

Table I.—*The Age-distribution of Treated Cases.*

Age in years.	Number of cases.
20–	3
30–	3
40–	4
50–	11
60–	8
70–	8
80–	5
Total	42

The duration of the existing attack of depression before desoxyephedrine was commenced in the cases who showed improvement and in whom the history was satisfactorily obtained is seen in Table II, which shows that improvement occurred with varying durations of depression.

TABLE II.—*Duration of Existing Depressive Attacks before Treatment with Desoxyephedrine in Cases who Improved.*

Duration in months.	Number of cases.
0–1	4
2–6	8
7–12	5
13–24	1
25–30	2
31–36	5
12 years	1

The degree of depression present at the commencement of treatment is difficult to define accurately, but, with the exception of 3 cases treated at an out-patient clinic, it was sufficiently severe for all patients to be willing to pay specialist fees. In addition, in 28 cases, the condition was sufficiently serious for the patients to enter a nursing home. In no case was the patient actively suicidal, although many harboured a desire for death, and thought "life not worth living."

Advanced age was not found to be an indication for withholding treatment, the cases treated of 80 years or more in age showing no adverse effects and improving under treatment. One case, aged 82 years, received doses up to 10 mgm. *t.d.s.* without ill effect, and another, aged 81 years, mgm. 10 o.m. and 7½ mgm. at 10 a.m. and at noon with benefit. The level of the blood pressure may be an important matter. Desoxyephedrine is d-N-methyl-amphetamine hydrochloride and one of the sympathomimetic group of drugs. The blood pressure at the beginning of the treatment is seen in Table III.

TABLE III.—*Number of Cases at Each Level of Systolic and Diastolic Pressure (in mm.) and at Pulse Pressures preceding Treatment.*

Systolic pressure.	Number of cases.	Diastolic pressure.	Number of cases.	Pulse pressure.	Number of cases.
90–	1	40–	1	20–	3
100–	2	50–	0	30–	2
110–	3	60–	5	40–	8
120–	7	70–	6	50–	9
130–	7	80–	16	60–	8
140–	7	90–	5	70–	2
150–	3	100–	3	80–	4
160–	3	110–	1	90–	0
170–	1	120	1	100	2
180–	2				
190–	1				
200	1				

The systolic pressures ranged from 98 mm. to 202 mm., the diastolic from 40 mm. to 128 mm. and the pulse pressure from 22 to 100 mm.

No adverse effects of the treatment were noticed at the levels shown in Table III, but in Case No. 16, a woman 72 years of age, a right hemiplegia developed during treatment. The blood pressure, taken a few hours after, was 255/160. Three days later it had fallen to 230/130; a further three days later to 170/100, but five days after this returned to its original level of 202/128. In this particular case the patient, from lying apathetically in bed taking no interest in her surroundings and being hand-fed, became talkative, commenced reading, took her meals herself, sat up in a chair, and walked.

It would appear that cases with levels of systolic pressure up to 200 mm. or of diastolic pressure of 120 mm. can be treated in safety with desoxyephedrine.

General Clinical Effect.

The general effect of desoxyephedrine is to make life appear more "rosy." After dosage adequate for the individual, depression lifts, mental and physical energy returns, apathy passes and euphoria may appear. The cerebral processes are quickened, although in Case No. 26, a lady of 81 years, this more active cerebration resulted in less bodily activity. This patient had suffered, in addition to her depression, from constant anxiety, especially with regard to the making of daily decisions. A high dose of desoxyephedrine prevented her from dressing, as her mental processes were too active for decisions to be made as to which clothes to wear or what she should do. By reduction and adjustment of the dose, the cerebral processes were stimulated sufficiently to help the patient perform her daily programme without her activities being paralysed by a too actively comparative mental process.

Another case of interest is No. 29, a man aged 29 years, who complained of depression, apathy, lack of interest and unreality feelings. He reported that amphetamine sulphate, with which he had previously dosed himself, produced more physical activity with proportionately less thought, whereas methedrine produced equal activity, but preceded by planning and more thought.

Frequently the patient continues to complain as before of depression, but observers notice that the appearance of depression is lessening. The patient, during the early days of the treatment, may deny improvement until it is pointed out that the same objective phenomenan, such as spells of crying, are less frequent. Even then the patient will often say that no improvement has occurred, as the feelings remain unchanged. An increase of dose at this stage will usually make the patient realize that slight improvement has taken place, and that the treatment is worth continuing. Owing to the apparent absence of improvement in the first few days, the patient should be told before its commencement that no improvement may occur at first.

The markedly increased mental activity that invariably occurs after adequate dosage of desoxyephedrine can be detrimental in agitated and anxious individuals. A fine clinical judgment is necessary to determine accurately whether the depression is a result of the anxiety, or the anxiety a result of the depression. When the first condition exists, desoxyephedrine enhances the agitation. An example of this was Case No. 42, a male medical student, 24 years of age, who was depressed and agitated. Desoxyephedrine reduced the depression and allowed him to continue with his studies. His "nervousness" increased and he complained that he was more "jittery." Observation clearly showed that, with even 2½ mgm. the anxiety became more severe. Abreaction, under hypnosis, abolished the anxiety and, in consequence, the depression, already improved, ceased. A second example is Case No. 14, a woman, aged 53 years, who developed depression and an intense fear of glass, although she had lived in a glass-dealer's shop all her life. Desoxyephedrine in 2½ mgm. doses intensified her fear and augmented her agitation. Analysis under hypnosis produced no abreaction. As, when recovered, she would, of necessity, return to her previous surroundings of glass, she was progressively trained back to the handling of whole and broken glass, the depression disappearing as confidence was regained.

Delusions accompanying depression are not effected by desoxyephedrine. The depression is reduced or abolished so that the delusional ideas, although persisting, do not trouble the patient so greatly, and he comes to accept them as beliefs which are self-evident and so do not require discussion. As a consequence of their not being constantly described they tend to become less intense. Case No. 30, a man 51 years of age, who showed depression, insomnia and absence of effort, and who complained of abnormal taste and that his enemies were trying to "dope" him and kill him, improved so greatly as regards his depression that he himself agreed that he was better. His delusions, although still present, were not held so firmly. Case No. 21, a married woman aged 50 years, followed a stranger about 15 miles believing he would guide her to a lover of 27 years earlier. On 2½ mgm. of desoxyephedrine once daily she lost her depression, and referred to her earlier lover only if closely questioned instead of constantly discussing her journey and its object. A dose of 5 mgm. twice daily agitated this patient, and brought on a recrudescence of her delusional ideas. Case No. 39, a married woman of 29 years, worked again actively in her house, cried less, regained self-confidence and became much less depressed when taking mgm. 10 thrice each morning, but still believed, without being able to give a reason for her unusual belief, that a man in a workshop beyond the end of her garden read her thoughts.

Obsessional thoughts, although not abolished by desoxyephedrine, may occur less frequently. Case No. 25, a woman of 67 years, was depressed, tearful and agitated, being particularly perturbed by the recurrence of the word "Liar" in her mind. This obsession had commenced at the age of 15 years, had ceased for many years, but had recurred latterly. When her depression had nearly vanished, about 5 weeks after the beginning of the desoxyephedrine, the frequency of the occurrence of the word was considerably reduced. Although the patient still objected to it, she was not depressed by its occurrence.

The depression of the hysteric may be improved by desoxyephedrine, but this change may, of course, be due largely or entirely to suggestion, as in a youth aged 19 years, in whom the mood varied with the environment and with his feelings towards those around him.

The manic-depressive who swings directly from depression to elation may be able to be balanced by a careful adjustment of dose. Case No. 17, a woman aged 30 years, was prevented from becoming depressed by a permanent dose of 5 mgm. in the morning and 2½ mgm. at midday. The elation also appeared to be reduced, the personality becoming more stable.

Patients suffering from regularly recurring attacks of depression could be given desoxyephedrine when the onset of the depression is due, but this method of administration has not been able to be tried in this series. Seventeen cases who had suffered from previous attacks of depression have been treated, their first depressive phases having occurred from 9 months to 30 years before the desoxyephedrine was commenced, and the last preceding attacks from 1 to 25 years earlier. The length of time since the first attack, or since the last attack, bore no relation to the results of treatment. For instance, Case No. 33, a business manager whose first depressive attack had occurred 23 years previously, improved as completely as did Case No. 36, whose first attack had taken place 19 months previously. With regard to the last attack, Case No. 24, whose last preceding attack occurred 21 years earlier, made as complete a recovery as did Case No. 35, whose last preceding attack took place 12 months earlier.

These recurring attacks of depression would, without doubt, have passed away if they had been untreated, but as 12 of the 17 cases improved whilst receiving the desoxyephedrine, the coincidence of this number improving at the same time, if the preparation had not been given to them, would have been remarkable. Of the remaining 5 cases, one showed no improvement on 2½ mgm. every morning, the only dose given to her; two were the agitated cases Nos. 5 and 14, and no recent reports have been received of the two others, Cases Nos. 31 and 34.

Improvement in symptoms, in addition to the depression with its accompanying apathy, loss of interest, etc., occurred in Case No. 27 who stopped picking her face; in Case No. 28 who became more self-confident and less complaining; in Case No. 15 whose delusions faded away; in Case No. 16 who began to talk, walk and read; in Case No. 18 who ceased being quarrelsome; in Case No. 25 whose obsessional thoughts became less frequent; in Case No. 40 whose self-confidence returned, and in Case No. 29 whose sense of unreality passed away.

Symptoms did not always cease concurrently. Depression disappeared in Case No. 11 before the loss of interest, so the patient, whilst acknowledging that she was happier, complained bitterly, until it returned, of her lack of interest in her surroundings and in her family. Case No. 25, although appreciating fully that she was less depressed and that she took, again, an interest in life, complained that her head pains, which were of a psychosomatic type, persisted. Another instance is Case No. 29, who improved markedly as regards his depression, but the feelings of unreality remained longer before they, too, finally faded away.

Dosage.

Emphasis must be laid on the necessity for care in the use of this preparation, but, used with constant observation and frequent adjustment of the dose, i.e. one or two days following each alteration, no serious adverse effects occur. Owing to every individual requiring an amount appropriate for him, the initial dose should be small, not more than 2½, mgm. given before breakfast, and if desired at midday. This quantity should not be increased by more than 2½ mgm. at one time, and not until 2 days have passed, so that a full knowledge of the effect of the dose has been obtained. Cases Nos. 5 and 41 are examples of the necessity of exercising care in the dosage.

Case No. 41, a man aged 34 years, could not tolerate more than 2½ mgm. A dose of double the size produced palpitation, pressure in the head and tremor, persisting for 1 to 2 hours on each of two occasions on which it was tried. Another case of intolerance is No. 5, a woman aged 62 years. The depression and agitation from which this patient suffered had disappeared after 6 electric convulsions. Five months later it had returned, and 12 further treatments with E.C.T. had had no effect. Desoxyephedrine, in doses of 2½ mgm. and 5 mgm., did not relieve the depression but increased the agitation, but both ceased during treatment with stilboestrol.

Once the observation has been made that the patient can tolerate 2½ mgm., the dose can be progressively increased by 2½ mgm. every third day until a total of 10 mgm. is being given, provided no undue restlessness, over-talkativeness, agitation, "racing" of the mind, gastro-intestinal disturbance, irritability, headache, giddiness, palpitation, tachycardia, flushing, tremors, sleeplessness or excessive sweating has occurred. The midday dose can be similarly increased to 10 mgm., and a third dose can be added at about 10.30 a.m. if considered advisable.

This slow process of reaching 30 mgm. in the first half of the day occupies, as a minimum, a period of 24 days. Consequently, if the patient requires this quantity in order to abolish the depression, a week or two may elapse before improvement appears. During this time the patient and his relations may consider the treatment valueless or may themselves increase the dose, perhaps giving an overdose and producing toxic symptoms. Case No. 29 is an example of this. This patient had been severely depressed for 18 months, and he considered that the small initial dose was insufficient. He gave himself 10 mgm. every morning and at noon. He immediately developed hyperacidity, tachycardia, hyperidrosis, irritability and self-pity. He then stopped the desoxyephedrine completely and became, again, severely depressed. Seen again, he was started on 7½ mgm. every morning and 5 mgm. at noon, and he progressively improved, returning to his work as a dispensing pharmacist.

The alternative of commencing treatment with a higher dose, such as 5 mgm., appears unwise. If the patient cannot tolerate this amount without discomfort the unpleasant symptoms may tend to increase the depression, and he may refuse to continue the treatment, considering that any dose will cause him distress. The slower process is, in consequence, the wiser, provided that it is adequately controlled by frequent observation.

Golla, Blackburn and Graham pointed out that as the effect of desoxyephedrine wears off, the subject may feel unduly tired and listless. For this subjective feeling Rudolf reported that, in the case of amphetamine sulphate, glucose was of value.

Insomnia produced by desoxyephedrine can be prevented by reducing the strength of the last dose or by administering it earlier, the duration of action of from 6 to 12 hours being taken into consideration. Hyperidrosis alone, such as of the palms, is not necessarily an indication for reduction of dose, even though, as in Case No. 34, it was increased by the desoxyephedrine. The patient perspired profusely, especially in the axillae, when anxious, as, for instance, before committee meetings and when meeting strangers. Amphetamine sulphate in doses of 2½ mgm. and 5 mgm. produced marked perspiration. Within 3 to 4 weeks of commencing desoxyephedrine the depression had considerably decreased, although the dose had not exceeded 5 mgm. daily, but the perspiration persisted. Tincture of belladona, 5 m. thrice daily and increase of salt intake failed to decrease the sweating, but as the anxiety decreased in association with the decrease of the depression the perspiration lessened, ultimately occurring only occasionally and not even necessarily at difficult committee meetings.

The duration of treatment varied from 6 days to 7 months in completed cases who improved (see Table IV). Table IV shows that the majority of cases who improved and about whom accurate information could be obtained required less than 2 months' treatment. The patients requiring the longer courses may, perhaps, correspond to those who require maintenance doses of E.C.T. over several months in order to reduce the depression and prevent its recurrence. An example is a woman to whom a course of 12 electric convulsions were given, but who required maintenance treatment over 14 months; 22 further shocks being given, before she remained continuously well.

TABLE IV.—*Duration of Completed Courses of Treatment in Cases who Improved.*

Duration.	Courses of treatments.
Less than 1 week	2
1–2 weeks	2
3–4 ,,	7
5–8 ,,	5
9–12 ,,	2
5 months	1
6 ,,	1
7 ,,	2

Prolonged, continuous administration of amphetamine sulphate has been noticed in some cases to diminished the effect (Rudolf), the temporary cessation of the preparation was found to be advisable in such cases. This decrease of effect has not been observed with desoxyephedrine in this series, although certain patients have now taken the preparation for 9 months.

Cessation of the treatment has, in this series, usually been sudden, but the dose has been decreased gradually in a few cases. Probably the sudden cessation is wiser, as any change of mood, indicating insufficient duration of treatment, is more noticeable. No adverse effects of sudden or gradual withdrawal have been observed, with the exception of the return of depression in insufficiently treated cases.

Results.

Of the 42 cases treated, 35 showed either slight or marked improvement. Satisfactory results were not obtained in Case No. 4, a manic-depressive of 72 years of age, who was swung into a hypomanic state by 2½ mgm.; in Cases Nos. 5, 9, 14 and 42 whose agitation increased on 2½ mgm.; and in Case Nos. 12 and 20 who were transferred to other institutions before the dose was raised above 2½ mgm. and 5 mgm. respectively.

The degree of improvement is difficult to describe. Twelve cases returned to their previous conditions and occupations, frequently that of housewife. One returned to his work as a pharmacist, one to that of a manager of quarries, and one to that of a head-master. One man, who had sold his public house when depressed, became a taxi-driver. Other patients showed a smaller degree of improvement in their general condition, although the depression disappeared entirely in many instances. These cases were Nos. 7, 9, 15 and 26, each aged over 80 years, and Nos. 3, 6, 16, 18, 22 and 28, each aged over 70 years.

The maximum duration of the improvement after the termination of the desoxyephedrine is not yet known. Many of the 35 instances of improvement are still under observation, and two cases are known to have relapsed 2 and 3 months after the end of the treatment. In both, further courses of treatment produced improvement equal to that obtained earlier. Absence of knowledge of relapse in some other cases does not necessarily mean that no relapse has taken place.

Electric-convulsive Therapy.

Four cases had been given E.C.T. before the treatment with desoxyephedrine. Case No. 1 improved after E.C.T. and with desoxyephedrine alone. Case No. 5 improved after the first course of E.C.T. but not after a second, and became more agitated on desoxyephedrine. Case No. 11 improved after each of four courses of E.C.T. and also after desoxyephedrine alone. Case No. 24 improved after the first course of E.C.T., failed to improve after a second, but improved on desoxyephedrine alone.

With the exception, perhaps, of those in the older age-groups the type of case treated in this series was that usually given E.C.T. The degree of improvement obtained was no less than that obtained in a previous series of cases treated with E.C.T. at the same nursing home, some cases attending as out-patients, and by the same psychiatrist. Although the numbers are too small for any definite or general statement to be made, Table V suggests that the

TABLE V.—*Results of E.C.T. and Desoxyephedrine in Cases Selected, Treated and Observed by Same Psychiatrist.*

	Cases treated.	Cases improved.
E.C.T.	30	25
Desoxyephedrine	42	35

immediate results with desoxyephedrine are no worse than those obtained with E.C.T.

In the table, the term "Improved" includes all marked and slight improvements, even if of a temporary nature. That the judgement of an improvement has not been too lenient is suggested by the percentage of improvements in cases of depression after convulsive therapy given by other observers compared with those of the present series (Table VI).

TABLE VI.—*Results of Convulsive Therapy in Depression.*

Author.	Number of cases.	Percentage improvement.
Bennett	146	96
Fitzgerald	150	95·3
Osgood	91	94·5
Fitzgerald	690	92·9
Muller	148	87
Present	30	83·3

The estimate of improvement in each case treated by E.C.T. was formed before the treatment of cases with desoxyephedrine was commenced. The total number of cases treated and the number of improvements with E.C.T. were not determined until after the similar figures for the treatment with desoxyephedrine had been obtained, so the exact correspondence of the percentages of improvement with E.C.T. and with desoxyephedrine is unlikely to be due to any psychological process of the observer, but must be a chance coincidence. If this similarity of results is confirmed in a large series of cases, and if no greater relapse rate occurs with desoxyephedrine than with E.C.T., it is clear that treatment by tablet is the method of choice. The possibility of the relapse rate after desoxyephedrine being greater than that after convulsive therapy is improbable, because, as Hinko and Lipschutz found, the relapse rate amongst cases treated with convulsive therapy was almost identical with that of cases which had improved without this treatment. Amongst the improved cases in the untreated group of 289 patients, 37·8 per cent. relapsed. Amongst 457 patients given convulsive therapy, 44·6 per cent. were given parole, the relapse rate amongst those given E.C.T. being 36·3 per cent.

SUMMARY.

1. Cases of depression, both male and female, in-patients and out-patients, and ranging from 24 to 89 years of age, were treated with desoxyephedrine. Improvement occurred in 35 of the 42 cases treated.

2. The duration of the existing attack of depression before the administration of the treatment varied, in the successful cases, from less than one month to 12 years.

3. The blood-pressure before treatment varied from 98 mm. to 202 mm. (systolic), and from 40 mm. to 128 mm. (diastolic). The pulse-pressure varied from 22 mm. to 100 mm.

4. The dose of desoxyephedrine required to reduce depression varied

according to the susceptibility of each patient, and ranged from the initial dose of 2½ mgm. once daily to 10 mgm. thrice before 1 p.m.

5. Depression frequently improved before other symptoms. These were often effected less, but as the depression ceased their intensity became reduced until, finally, they tended to fade away.

6. Seventeen cases with recurring attacks of depression, of which the first had occurred from 9 months to 30 years previously, were included in the series. Of these 17 cases, 12 improved.

7. The degree of improvement varied, but one case returned to his work as a pharmacist, one as a quarry manager, one as a head-master, many to that of housewife, and one became a taxi-driver.

8. The series of cases treated with desoxyephedrine were compared with a series of 30 depressive cases treated by the same psychiatrist with E.C.T. The percentage of improvement was identical in the two series.

9. If confirmation of these similar results is obtained on large series of cases, the treatment with desoxyephedrine is obviously preferable.

My thanks are due to Dr. E. Casson for permission to refer to cases treated at Mount Pleasant Nursing Home.

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THE ACTION OF GLUTAMIC ACID IN HYPOGLYCAEMIC COMA.*

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The loss of consciousness in hypoglycaemia is generally regarded as a direct consequence of the fact that the brain cells are being increasingly deprived of glucose, their principal fuel. The prompt relief of symptoms by glucose administration led to a number of investigations on the effect of other substrates known to sustain the respiration of surviving brain slices *in vitro*. Amongst these are various mono- and disaccharides, and such acids as lactic, pyruvic, succinic or glutamic acid which may be formed from glucose in the course of its metabolism. It appeared, however, that, in contrast to their *in vitro* action, most of these substances, including glutamic acid, were unable to relieve the symptoms of hypoglycaemia in eviscerated or hepatectomized animals (Bollmann and Mann, 1931; Maddock, Hawkins and Holmes, 1939). Similarly, lactic and pyruvic acids were found to have no effect on the oxygen consumption of the brain or the comatose state of hypoglycaemic patients undergoing insulin shock therapy (Wortis and Goldfarb, 1940; Goldfarb and Wortis, 1941). It has been shown for several substrates, including glutamic acid, that their rate of diffusion from the blood stream into brain tissue was markedly slower than that of glucose, and that therefore the concentration necessary for the maintenance of nervous function was not reached (Klein, Hurwitz and Olsen, 1946; Klein and Olsen, 1947). In harmony with this are the observations of Friedberg and Greenberg (1947), and of Waelsch, Schwerin and Bessman (1949) that intravenously injected glutamic acid is not taken up by brain tissue. The differences between the *in vitro* and *in vivo* results seemed to be adequately explained by these experiments.

The demonstration by Mayer-Gross and Walker (1947, 1949) that the coma of some hypoglycaemic patients may be terminated by an intravenous injection of glutamic acid was therefore unexpected. To reconcile it with the facts already known one of the following two assumptions may be made: (1) that there exists a species difference between the experimental animals previously used and the human subject, and that in consequence of this the effective concentration of glutamic acid is either lower, or reached more readily in human than in animal brain; or (2) that the inactivity of glutamic acid in the animal experiments was due to the absence of the viscera, especially liver and adrenals. In this case the effect would not be due to a direct action of glutamic acid on the brain cells, be it as fuel or in connection with some specific metabolic function of glutamic acid, but would ensue from a primary effect elsewhere, e.g. conversion to glucose in the liver or hormonal stimulation.

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* A Paper read at the Quarterly Meeting of the Royal Medico-Psychological Association on 23 February, 1949.

A direct utilization of glutamic acid as fuel for the brain cells is unlikely as explanation for the effect. It would be difficult to understand why closely related metabolites such as lactic, pyruvic or succinic acid, all like glutamic acid readily oxidized by brain slices, should not be equally effective. The inactivity of succinic acid, which is in the direct path of oxidation of glutamic acid, has been shown by Mayer-Gross and Walker and confirmed in this hospital. On the other hand, Mayer-Gross and Walker have found that glycine and p-aminobenzoic acid have effects similar to that of glutamic acid, yet there is no evidence that these substances can be utilized by brain cells *in vitro*.

In the same way the absence of any correlation between the activity of a substance and its glycogenic properties argues against the effect being due to the conversion of glutamic acid into glucose by the liver. Moreover, since the liver is the locus of the supposed transformation, feeding of glutamic acid by nasal tube should be even more effective than intravenous injection, yet a number of feeding experiments have shown negative results, confirming similar experiments reported by Mayer-Gross and Walker. Finally, conclusive evidence will be presented showing that the injection of small doses of glutamic acid elicited a rise of blood sugar far in excess of the limits which could have been reached had the glucose originated from the injected glutamic acid.*

The conclusion arrived at in this communication is that the effect of glutamic acid in hypoglycaemic coma is entirely due to adrenergic stimulation. It is based on the following observations:

(1) The injection of glutamic acid in hypoglycaemic coma induced the classical triad of adrenaline action, rise of blood pressure, rise of pulse rate and rise of blood sugar.

(2) The minimum effective dose of glutamic acid was found to be much smaller than the dose given by Mayer-Gross and Walker, suggesting a catalytic mechanism.

(3) Blood taken from hypoglycaemic patients after glutamic acid injection showed increased adrenergic activity compared with blood taken before the injection.

(4) Intravenous injection of adrenaline produced the same effects as glutamic acid. In particular the rise of blood sugar was of the same order of magnitude.

EXPERIMENTAL.

The monosodium salt of glutamic acid was used for injection. To avoid the undesirable admixture of large quantities of NaCl the salt was prepared from free glutamic acid by the addition of the calculated amount of sodium hydroxide solution. The solutions were 25 per cent. with respect to free glutamic acid.

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* Mayer-Gross and Walker also cite the absence of change in blood urea as evidence against the conversion of glutamic acid into glucose. This is, however, a doubtful argument, as the absorption of glutamic acid does not lead to increased urea formation (Leuthardt and Glasson, 1946).

Adrenaline was injected in solutions containing 5 mgm. in 100 ml. of saline (1:200,000) at a rate of 1–2 ml. per minute.

Solutions for injection were sterilized by filtration through Seitz filters and stored in sealed ampoules.

Blood sugar was determined in duplicate by the method of Nelson (1944) on 0·2 ml. samples of capillary blood. Samples were collected before and 5 minutes after the injection, in the case of adrenaline 10 minutes after the beginning of the injection.

Consciousness was regarded as fully restored when the patient was able to drink from a cup the full amount of glucose routinely given by nasal tube to terminate the coma (about 1 pint). These cases are denoted in the tables by +. When the patient was sufficiently awake to respond when spoken to, but was unable to drink sufficiently, the case is denoted by (+).

Other experimental details will be described in the following section.

RESULTS.

The effect of intravenous injection of glutamic acid.—Table I contains some typical results obtained with glutamic acid in cases of hypoglycaemic coma. Mayer-Gross and Walker found a positive response in a little over half the injected cases; a similar proportion was found in this hospital. It should be pointed out that, whereas in some cases the response seems to be consistently either negative or positive, it may be variable from day to day in others. This is hardly surprising if, as we believe, the positive response depends on such a variable quantity as the level of mobilizable liver glycogen.

Table I shows that the dose of 80 ml., chosen by Mayer-Gross and Walker, is unnecessarily large. Positive results were obtained with 5 ml. and, in favourable cases, even with 2 ml. Injection of 1 ml., however, had no effect on consciousness, although even with that dose a blood-sugar rise was noticeable. The 2 ml. dose contained 0·5 gm. of glutamic acid, which could, under the most favourable conditions, have yielded no more than about 0·3 gm. of glucose, i.e. assuming that 100 per cent. of the 3-carbon residue of glutamic acid would have been converted to glucose. Yet this dose elicited a blood-sugar rise of 20 mgm. per cent. or more. Assuming a blood volume of 7 l., this corresponds to the appearance of 1·4 gm. of glucose, and probably more if the extracellular tissue fluids are taken into account. The blood-sugar rise is therefore at least 4 times greater than can be accounted for by the amount of glutamic acid injected.

The injection of glutamic acid usually caused a marked increase of blood pressure and—unless it was accelerated even before the injection—of pulse rate. The blood-pressure rise, which sometimes amounted to 50 mm. Hg. or more, was of the typical fleeting form associated with adrenaline action and usually subsided within 1–2 minutes (Figs. 1–4). In the writer's opinion these phenomena were not the result of unspecific stimulation. The observations were extended over a considerable period before injection and, in the majority of cases, the blood pressure did not show any large fluctuations. Muscular spasms sometimes produced a blood-pressure rise, but phases of rigidity were

TABLE I.—*Effect of Intravenous Injection of a 25 per cent. Glutamic Acid Solution on Patients in Hypoglycaemic Coma.*

Patient.	Sex.	Ml. injected.	Blood pressure (mm. Hg.).		Pulse rate/minute.		Blood sugar (mgm. %).		Restoration of consciousness.
			Before injection.	Maximum after injection.	Before injection.	Maximum after injection.	Before injection.	5 minutes after injection.	
B. K—	M.	10	128/65	144/65	70	97	..	..	+
		5	130/78	180/110	72	112	19	38	+
		5	..	..	..	..	10	30	+
		2	130/88	156/90	70	96	12	33·5	(+)
		2	136/90	148/80	84	98	13	27	(+)
		1	130/74	112/68	84	100	9	14	—
L. F—	M.	100	126/66	170/90	68	96	..	..	+
		10	112/78	154/82	72	72	22	43	+
		5	124/78	164/90	72	80	20	38	+
		5	134/86	170/84	78	102	30	53	+
		2	114/67	166/94	80	104	23	44	+
		1	134/80	130/80	80	88	28	34	—
E. S—	M.	100	136/70	180/80	68	84	..	..	—
		10	134/64	176/78	68	80	13	19	—
		5	..	..	..	..	11	23	—
S. C—	F.	5	140/70	200/100	100	112	7	27	+
		2	130/80	165/80	118	130	6	21	—
D. J—	F.	5	120/80	168/110	116	96	14	23·5	+
W. R—	F.	5	115/70	160/100	93	105	11·5	19	(+)
U. R—	F.	5	120/70	150/90	90	104	22	30·5	+
M. S—	F.	5	125/86	140/70	114	120	17	20·5	—

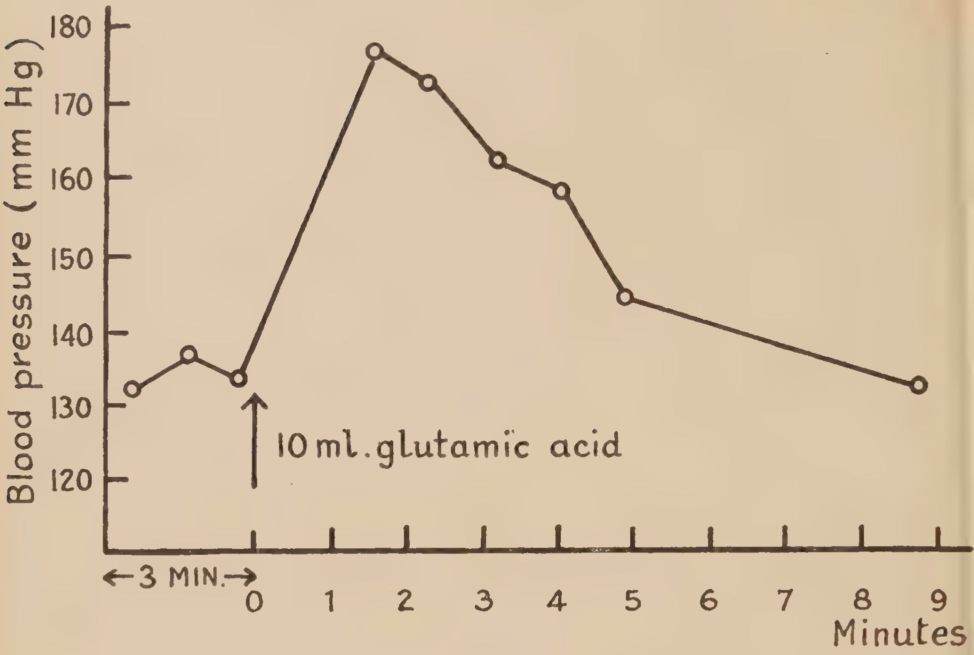


FIG. 1.

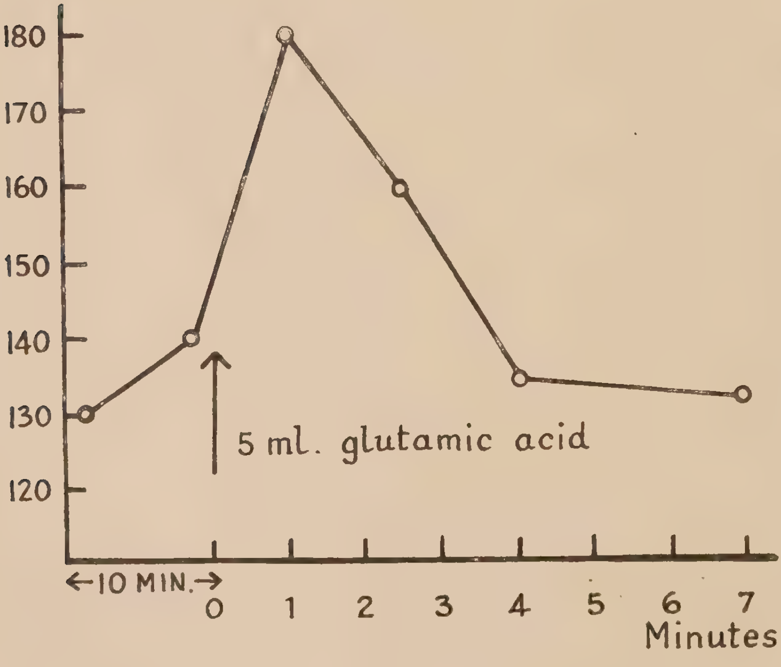


FIG. 2.

FIGS. 1–4.—Effect of glutamic acid injections on the blood pressure of patients in hypoglycaemic coma.

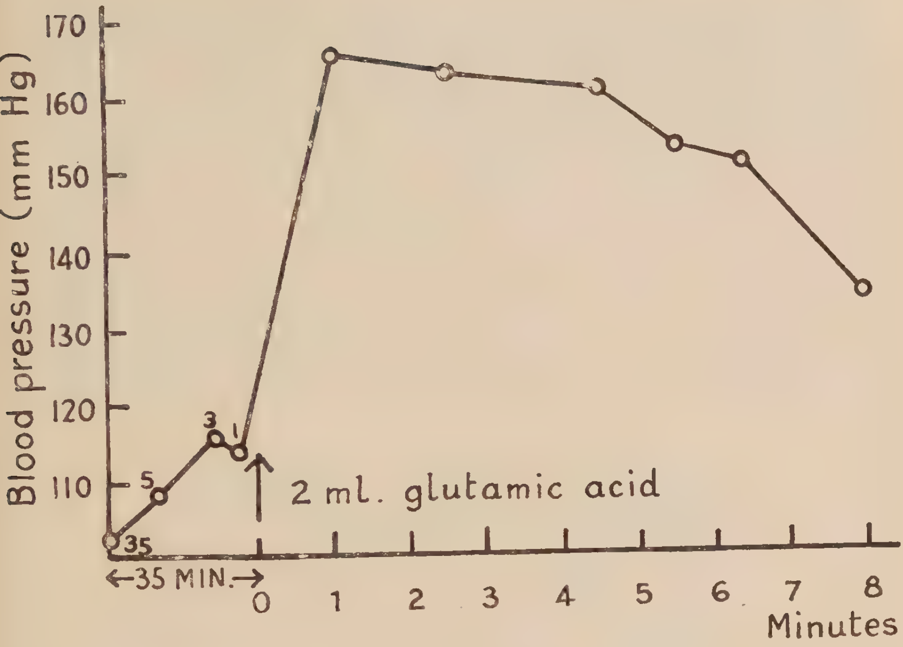

Blood pressure (mm Hg)
170
160
150
140
130
120
110
35
5
3
1
2 ml. glutamic acid
←35 MIN.→
0
1
2
3
4
5
6
7
8
Minutes

FIG. 3.

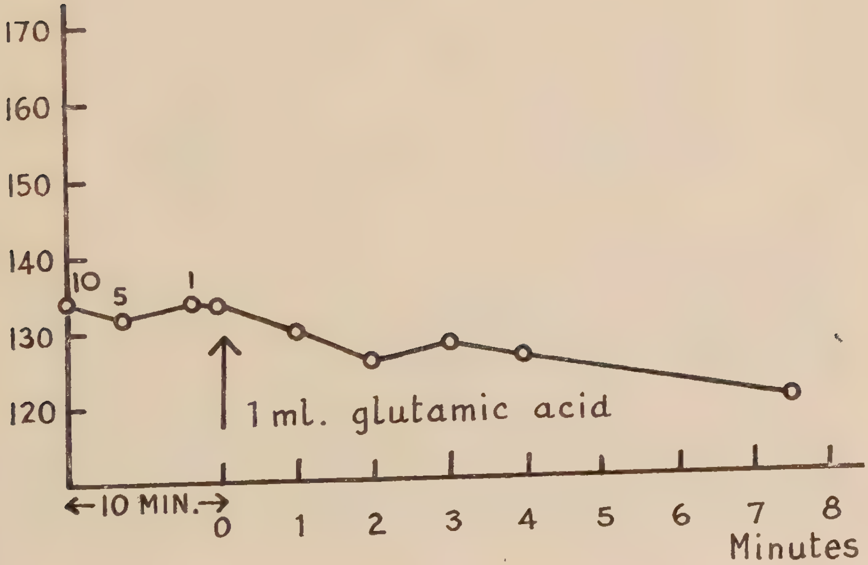

170
160
150
140
130
120
10
5
1
1 ml. glutamic acid
←10 MIN.→
0
1
2
3
4
5
6
7
8
Minutes

FIG. 4.

always allowed to pass before the injection was started. The injection of glutamic acid did not produce rigidity; on the contrary, it usually led to a marked relaxation and decrease of restlessness. The volume of the injected solutions was small and, on that score, did not constitute any undue stress. Furthermore, there is some correlation between blood-pressure rise and the efficacy of the injection. Whereas 5 or 2 ml. still produced a blood-pressure rise, 1 ml. failed to do so. Results, reported in Table III, with the protein hydrolysate "casydrol" show that the injection of much larger volumes of this solution had a much smaller effect on the blood pressure.

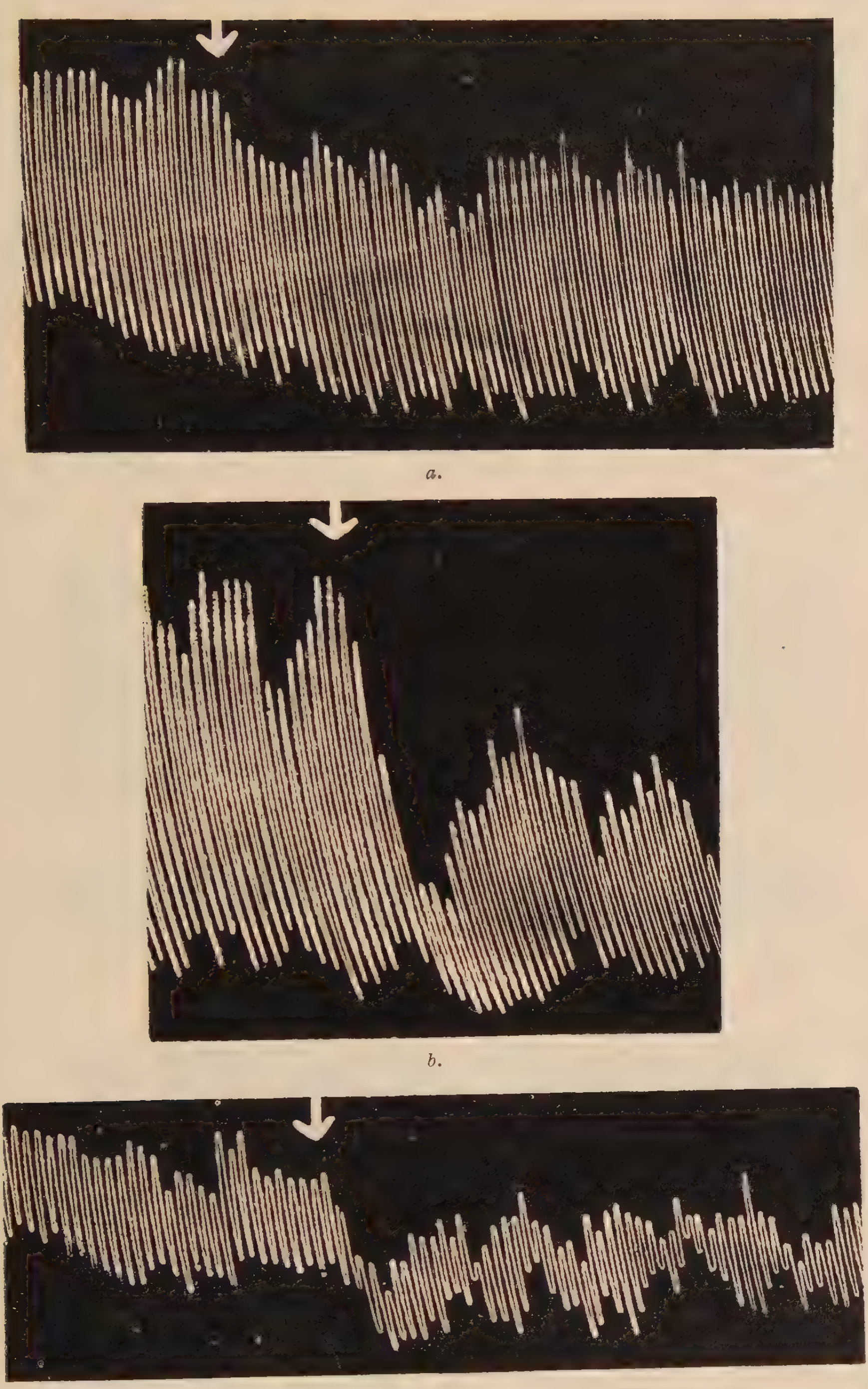
Presence of adrenergic substances in blood.—For the detection of adrenergic substances in blood a preparation of rabbit's intestine was used. A strip of jejunum, 1–1·5 cm. long, was attached to a recording lever and suspended in 100 ml. Krebs' bicarbonate Ringer solution containing 0·1 per cent. glucose at a temperature of 37° C. A slow stream of O_2/5 per cent. CO_2 mixture was led through a sintered glass plate into the solution. Provision was made to empty and flush out the container between tests without disturbing the tissue preparation. The solution to be tested was added in a volume of 1 ml.

Venous blood samples were withdrawn before and 5 minutes after the intravenous injection of 5 ml. glutamic acid; heparin was used as anti-coagulant.

No clear effect was obtained when either whole blood or plasma was tested. With both fluids there was frequently an initial inhibition, followed by a stimulation of contractions, but there was no significant difference between samples collected before or after the injection of glutamic acid. When, however, a solution of washed and laked blood corpuscles was used, a clear effect was frequently observed. The haemolysate was prepared by washing the corpuscles three times with saline, suspending them in distilled water up to the original blood volume and twice freezing the resulting solution. Two typical results are reproduced in Figs. 5 and 6. In the first case (Fig. 5) addition of the pre-injection sample had only a very slight effect, whereas the post-injection sample produced a considerable and lasting relaxation. In the second case (Fig. 6) there was a transient relaxation after the addition of the pre-injection sample. On adding the post-injection sample a strong and lasting relaxation occurred, which closely simulated the effect of 0·5 μgm. of adrenaline (Fig. 6, *c*).

It is well known that adrenaline added to blood *in vitro* is partly incorporated into the corpuscles, and may become biologically active only after laking. The blood cell adrenaline concentration may be 4–5 times greater than the plasma adrenaline concentration, especially when the concentrations are low (Bain, Gaunt and Suffolk, 1937). It need not be assumed, however, that adrenaline was absent from plasma in our experiments, as its action may have been masked by the presence of antagonists (*cf.* Gaddum, Peart and Vogt, 1949). What is surprising is the fact that the combination with cell constituents should have been so rapid, since the equilibrium is established only after a considerable time *in vitro*.

The effect of intravenous injection of adrenaline.—If glutamic acid acts by stimulating adrenaline secretion, it should be possible to obtain the same

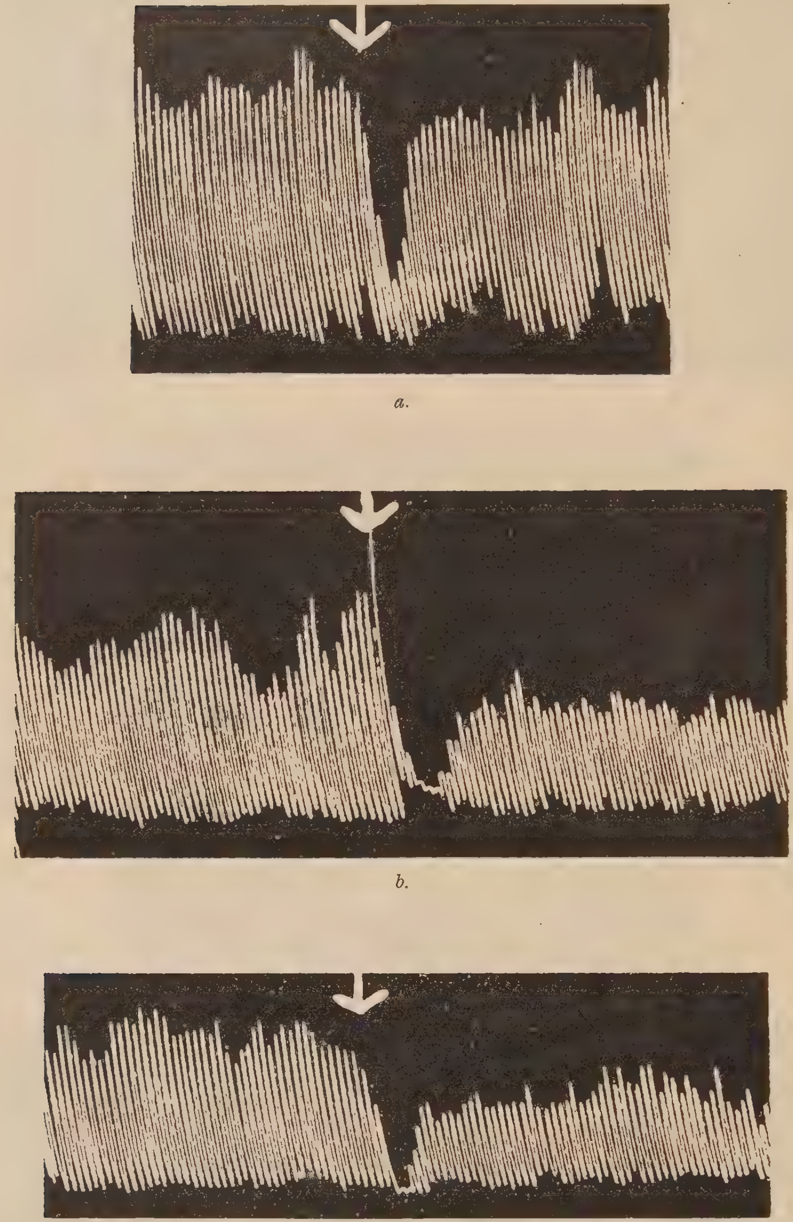


a.

b.

c.

Fig. 5.—Effect of the addition of 1 ml. of corpuscle lysates on the isolated rabbit intestine. (*a*) Lysate prepared from blood of patient in hypoglycaemic coma before injection of glutamic acid. (*b*) and (*c*) Lysate from blood of the same patient 5 min. after injection of 5 ml. glutamic acid solution. Samples added at time marked by arrow.



a.

b.

c.

Fig. 6.—Effect of corpuscle lysates (1 ml. samples) on the isolated rabbit intestine. (*a*) Lysate withdrawn from patient in hypoglycaemic coma before injection of glutamic acid. (*b*) Lysate from blood 5 minutes after injection of 5 ml. glutamic acid solution. (*c*) Addition of 1 ml. of adrenaline solution containing 0·5 μgm.

effects with adrenaline. To avoid the complications of local vasoconstriction it was decided to administer adrenaline by slow intravenous injection at the rate of about 50 μgm. per minute. A continuous control of blood pressure and pulse was maintained during the injection. Except for a pronounced pallor no alarming symptoms were observed. Both blood pressure and pulse rate were increased during the injection, but quickly returned to the norm. The patients chosen for these experiments had previously been found to respond to the injection of glutamic acid. With two exceptions they responded to adrenaline in a similar way (Table II). The return of consciousness seemed even accelerated, and the patients changed from coma to full alertness without a stage of confusion and noisiness which so often intervenes after the usual glucose feed.* One of the two negative cases had previously shown a slight, and the other a variable reaction to glutamic acid. If the action of adrenaline depends on the level of liver glycogen, such variations are to be expected.

TABLE II.—*Effect of Intravenous Injection of Glutamic Acid and Adrenaline on Patients in Hypoglycaemic Coma.*

Patient.	Sex.	Glutamic acid solution. (ml. injected.)	Adrenaline solution. (ml. injected.)	Blood sugar (mgm. %). Before injection.	Blood sugar (mgm. %). After injection.	Blood sugar (mgm. %). Increase.	Restoration of consciousness.
R. F—	M.	5	..	18	27·5	9·5	(+)
		..	10	14·5	33·5	19	+
R. G—	F.	5	..	0	23·5	23·5	(+)
		..	5	5	14·5	9·5	—
H. R—	M.	5	..	17	27	10	(+)
		..	5	12·5	46·5	34	+
J. H—	M.	10	..	12·5	40	27·5	+
		..	6	11	38·5	27·5	+
H. W—	F.	10	..	18	42·5	24·5	+
		..	8	32	54·5	22·5	+
D. P—	M.	5	..	18	33	15	(+)
		..	5	17	41·5	24·5	+
J. Ho—	M.	10	..	19·5	32	12·5	+
		..	6	18	35	17	+
C. C—	M.	10	..	23.5	32·5	9	+
		..	9	18.5	30	11·5	+
De P—	M.	10	..	18	37	19	+
		..	10	23	45	22	+
A. S—	F.	10	..	13	29	16	+
		..	8	11	22	11	+
A. St—	M.	10	..	9	24	15	+
		10	..	5·5	15·5	10	—
			6	19	19	0	—

The blood-sugar rise was in some cases almost identical with that produced by glutamic acid. Where differences exist they do not seem significant, and the maximum effect of adrenaline on the blood sugar did not exceed that which was found possible for glutamic acid in favourable cases.

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* Patients injected with glutamic acid were also frequently seen to wake up without passing through a phase of confusion or anxiety. Their greater mental brightness and alertness during the rest of the day was repeatedly the subject of spontaneous comment by nursing and occupational therapy staff.

The effect of intravenous injection of a protein hydrolysate.—In view of Mayer-Gross and Walker's results with glycine and p-aminobenzoic acid, the question arose whether the action of glutamic acid can be accounted for simply by an increase of blood amino-N. The effect of " casydrol," a 5 per cent. enzymic digest of casein, was therefore investigated. A preparation free of glucose was obtained on request from the manufacturers. Its analysis showed that it contained 0·52 per cent. amino-N and 1·22 per cent. total N, corresponding to a hydrolysis of 42 per cent. The concentration of free glutamic acid was found to be 0·35 per cent.

For the estimation of free glutamic acid the dicarboxylic acid fraction was isolated chromatographically by the method of Fromageot, Jutisz and Lederer (1948) and oxidized with $KMnO_4$. The solution was then subjected to continuous ether extraction for 12 hours, and the silver salt of succinic acid titrated according to Arhimo and Laine (1939).

The results (Table III) show that, although there was some effect on blood pressure and blood sugar, and although the depth of coma was decreased in some cases, full restoration of consciousness could not be achieved with the doses given, and this in spite of the fact that the content of amino-N of the higher doses was more than twice as high as that of the minimum effective dose of glutamic acid. It may be concluded that the effect of glutamic acid is not merely a function of its amino-N.

Discussion.

The possibility that the effect of glutamic acid is based on an adrenergic mechanism was discussed by Mayer-Gross and Walker, but was considered improbable, mainly because these authors had found that after the injection of glutamic acid, consciousness is restored at a lower level of blood glucose than after the administration of glucose. This argument implies that, if consciousness could be restored by a purely adrenergic mechanism, e.g. by the injection of adrenaline itself, the blood-sugar rise would have to be higher than after the injection of glutamic acid. This is not the case ; it has been shown that after a successful adrenaline injection the blood-sugar rise is not materially different from that found after glutamic acid injection.

The objections against an adrenergic mechanism of the glutamic acid effect therefore lose much of their force, and if there is indeed a difference in the blood-sugar level at which consciousness returns, it must be concluded that, after the injection or mobilization of adrenaline, auxiliary factors operate which allow the return of consciousness at a lower blood-sugar level than after glucose administration. At least two functions of adrenaline are known which may be important in this connection : (1) As shown by Rein (1937), slow infusion of adrenaline in physiological doses raises the cerebral blood flow and may thus increase the utilization of glucose. (2) Adrenaline has a direct action on nervous tissues : it facilitates impulse transmission and

TABLE III.—*Effect of Intravenous Injection of "Casydrol" on Patients in Hypoglycaemic Coma.*

Patient	Sex.	Ml. injected.	Blood pressure (mm. Hg.).		Pulse rate/minute.		Blood sugar (mgm. %).		Restoration of consciousness.
			Before injection.	Maximum after injection.	Before injection.	Maximum after injection.	Before injection.	5 minutes after injection.	
L. F—	M.	10	134/80	154/100	72	78	16	23	—
S. C—	F.	5	190/80	190/80	132	134	16	25	—
		20	160/60	210/90	120	156	5	23	(+)
J. G—	F.	10	120/30	130/70	70	80	20	31	—
		25	135/75	140/70	102	116	16·5	31	—
M. S—	F.	10	110/70	110/70	..	..	11	21	—
W. R—	F.	25	134/60	144/70	80	112	8	11	—

potentiates the action of acetylcholine (Burn, 1945). This effect in particular may assist in the restoration of cortical functions.

The response of patients in hypoglycaemic coma to relatively small doses of adrenaline may seem surprising to those who hold that insulin hypoglycaemia entails a state of constant and extreme stimulation of the adrenal system. Without denying that there is some degree of adrenal stimulation in hypoglycaemic coma, it may be pointed out that attempts to demonstrate an increased level of adrenaline in the blood of hypoglycaemic patients have yielded neither uniform nor impressive results (Heilbrunn and Liebert, 1939; Tietz and Birnbaum, 1942). However this may be, the present results show that the susceptibility to a sudden adrenergic shock has not been lost.

Another fact which may seem unexpected is the presence in such a large proportion of cases of sufficient reserves of liver glycogen to allow for blood sugar rises of 20 mgm. per cent. or more after the onset of coma. For a blood volume of 7 l. this would correspond to the mobilization of 1·4 gm. of glucose. Assuming a liver weight of 1500 gm., the glycogen content of the liver must have amounted to 0·09 per cent. if the glycogen stores were completely emptied, or to 0·18 per cent. if they were halved. These are not impossible figures even in hypoglycaemic coma, and are of an order similar to those found by Höpker (1947) in hypoglycaemic rats, having regard to the large variations between species, between individuals, and possibly in the same individual from day to day.

Finally, the adrenergic activity of glutamic acid, and possibly other amino-acids, requires some comment. It has been known for some time that the level of amino-acids in human and animal blood is lowered during insulin hypoglycaemia. According to Davis and Van Winkle (1934) this fall no longer occurs after adrenalectomy and it is therefore attributed by these authors to the secondary action of adrenaline. This opinion is shared by Luck and Morse (1933), who found that adrenaline injection decreases the blood amino-acid level. On the other hand, Nord (1926–27) showed that the injection of glycine or glutamic acid causes a pronounced hyperglycaemia in rabbits, which exceeds the blood-sugar rise after the injection of an equivalent dose of glucose, and that these amino-acids are able to antagonize the hypoglycaemic action of insulin. Both effects were abolished after adrenalectomy, and they were interpreted by Nord as resulting from a powerful stimulation of adrenaline secretion. In a footnote Nord mentions that the chromaffinity of adrenal medulla is diminished in rabbits which had received injections of glutamic acid or glycine. There is thus ample experimental evidence for a mutual interaction between the adrenal system and some amino-acids.

Recently, reports of favourable results achieved with oral administration of glutamic acid in the treatment of mental deficiency (Zimmerman *et al.*, 1946, 1947, 1948) have aroused great interest. It may be suggested that, in this instance too, an adrenergic mechanism may be worth serious consideration. It is not claimed by its originators that glutamic acid therapy causes an actual increase of intelligence, but that it enables the mentally deficient subject to reach the " ceiling " of his intellectual powers. The psychological effects of amphetamine and related adrenergic drugs, such as increase of mental efficiency, of capacity to concentrate, of spontaneity, initiative and sociability (Reifenstein and Davidoff, 1939; Nathanson, 1937), are very reminiscent of those claimed for glutamic acid in mentally retarded children.

SUMMARY.

The effects of intravenous injection of a 25 per cent. neutral solution of glutamic acid have been studied after the onset of hypoglycaemic coma in patients undergoing insulin shock therapy and the following observations are recorded:

(1) The minimum effective dose of glutamic acid solution necessary for the restoration of consciousness in comatose patients was found to be 5 ml., and in favourable cases 2 ml. The blood-sugar rise produced by these doses is greater than can be accounted for by the amount of glutamic acid injected. It is concluded that the effect is due neither to a direct utilization of glutamic acid as fuel for the brain cells nor to its conversion into glucose by the liver, and it is suggested that only a catalytic mechanism can account for the high degree of activity of glutamic acid.

(2) The injection of glutamic acid induced the classical triad of adrenaline action: a fleeting rise of blood pressure and pulse rate (the latter only when it was not accelerated before the injection) and a rise in blood sugar.

(3) Blood samples taken before and after the injection of glutamic acid were examined for adrenergic activity by the rabbit's intestine method. No effect was found when whole blood or plasma was tested, but when a solution of washed and laked blood corpuscles was used the post-injection sample frequently showed a clear increase of adrenergic activity over the pre-injection sample.

(4) Intravenous injection of adrenaline at the rate of 50 μgm./min. duplicated in every respect the effect of glutamic acid in terminating the coma and in producing a blood-sugar rise.

(5) Injection of "casydrol," a 5 per cent. enzymic digest of casein, in doses which contained more than twice as much amino-N as the minimum effective dose of glutamic acid, had some effect on blood pressure and blood sugar and in some cases lessened the depth of coma, but full restoration of consciousness was not observed. It is concluded that the effect of glutamic acid is not merely a function of its amino-N.

The results are discussed and the opinion is expressed that the objections against the adrenergic mechanism of the glutamic acid effect are without foundation. It is also suggested that an adrenergic mechanism may account for the favourable results of glutamic acid therapy in mental deficiency.

I am greatly indebted to the Medical Superintendent, Dr. R. Ström-Olsen, not only for his constant inspiration and encouragement, but also for his practical co-operation in the clinical part of this investigation. I also wish to acknowledge the expert technical assistance of Mr. A. D. Bone.

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A COMPARATIVE STUDY OF THE A-B RIDGE COUNT ON THE PALMS OF MENTAL DEFECTIVES AND THE GENERAL POPULATION.

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The finger-prints of mental defectives have been investigated by Bonnevie (1927), Poll (1935) and Møller (1935). It was found that the frequency of whorls was less in the feeble-minded and imbeciles than in the general population but there was no correlation between intelligence quotients and quantitative values of patterns among defectives. Very little investigation has been carried out on the epidermal ridges of palms in mental defectives except in the case of mongoloid imbeciles, where Cummins (1939) and Workman (1939) have investigated the main patterns. Penrose (1949) has measured the angles subtended at triradius *t* by triradii *a* and *b*, and the present writer has counted the epidermal ridges between the *a* and *b* triradii.

A triradius is the meeting point of three opposing epidermal ridges. There are generally four digital triradii at the bases of the fingers II, III, IV and V called *a*, *b*, *c* and *d*, and an axial triradius at the base of the palm called *t*. When a thin line is drawn joining the triradii *a* and *b*, the number of ridges touching the line can be counted under a good magnifying lens or a binocular microscope. The *a-b* ridge count on the human palm was found to be partly genetically determined, and there was also a significant difference between mongoloids and the control population with regard to this character. This measurement has also been made on mental defectives, excluding mongoloids. During the inquiry it was suspected that the character in question might have some relation to mental development, and a sample of palm prints of University students was collected and included in the investigation. Thus the present study is based on three samples of palm prints, some results from the work on the mongoloids being included for comparison:

(1) 459 unrelated mental defectives, excluding mongoloid imbeciles, chiefly consisting of unspecified types of feeble-mindedness, imbecility and idiocy.

(2) 859 unrelated individuals, mainly school children, as a control population.

(3) 204 unrelated University students.

The distributions.—Fig. 1 shows the distributions of the *a-b* ridge count in defectives, students and the control population; the curves are not very regular. For convenience, a division was made between the ridge counts 39 and 40, which may represent a natural dividing line from the genetical point of view.

The means.—The mean *a-b* ridge counts of the three samples are set up in Table I.

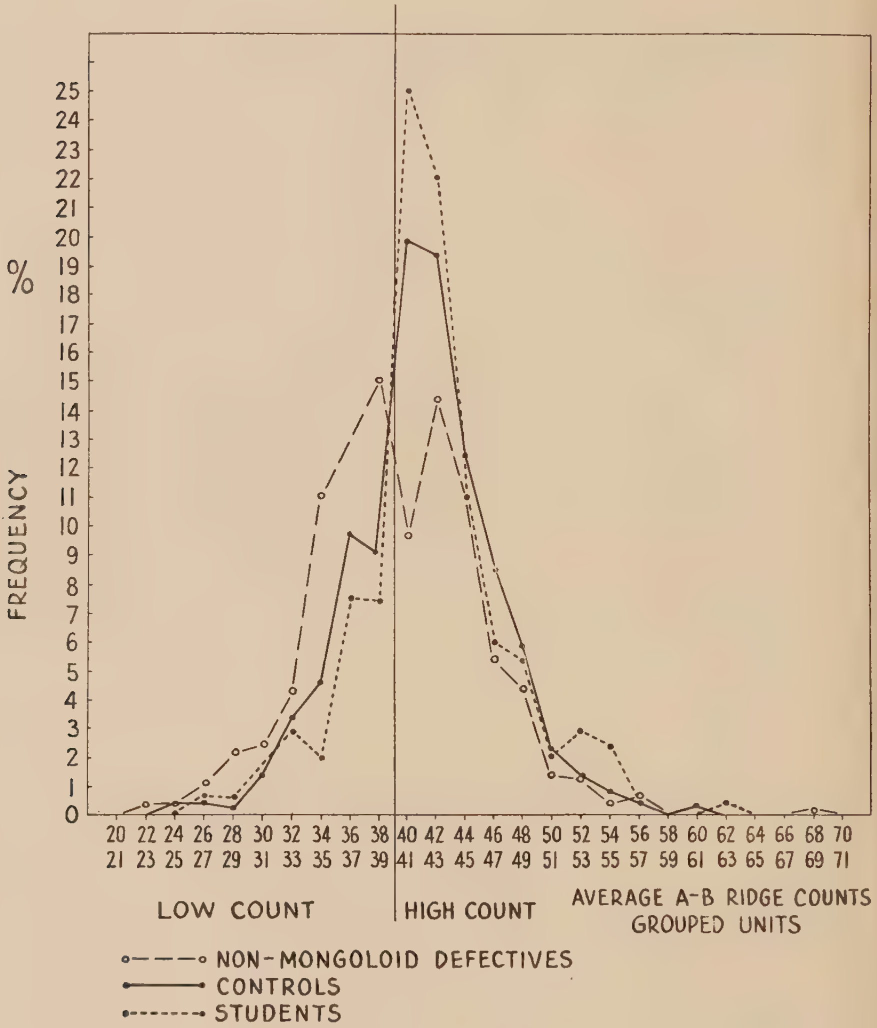

FIG. 1.—The distributions of the *a-b* ridge counts in mental defectives (non-mongoloid), students and control population.

On the assumption that the students are more intelligent than the control population, there is a steady increase in the mean ridge count with intelligence. The mean difference between the mental defectives and the control population is 1·90, with a standard error 0·32, while that between the students and the control is 0·62, with a standard error 0·40. The association of low ridge count and mental deficiency is here seen to be significant.

The variances.—The test of significance of difference between variances was applied to the mean squares of the mental defectives and the control population. Fisher's (1948) z was found to be 0·17 with a standard error 0·04. So the variance of the mental defectives is significantly higher than that of the control sample.

TABLE I.—*The Means of the a-b Ridge Count in Defectives and General Population.*

Sample.	Sex and number.	Means and standard deviations.	
Non-mongoloid mental defectives	M. 258	39·92±6·12	39·62±5·9
	F. 201	39·28±5·59	
Mongoloids	M. 91	38·44±5·71	39·01±5·0
	F. 96	39·59±4·34	
Control population	M. 424	41·52±5·14	41·52±5·0
	F. 435	41·51±4·86	
University students	M. 126	41·75±4·9	42·14±5·2
	F. 78	42·52±5·6	

Frequencies of low and high counts.—Using the simpler criterion of two types, low and high ridge counts, the percentage frequency of low counts is about 50 per cent. in the non-mongoloid defectives, 55 per cent. in mongoloids, 22 per cent. in the students, and 28 per cent. in the control population (see Table II).

The frequency difference between the mental defectives and the control population is 22 per cent. with a standard error 2·79 per cent., while that between the students and the control population is 6·2 per cent. with a standard error 3·27 per cent.

TABLE II.—*The Frequency of the Low a-b Ridge Counts in Defectives and General Population.*

Sample.	Sex and number.	Number of low counts.	Percentage of low counts.	Percentage of low counts, both sexes.
Non-mongoloid mental defectives	M. 258	127	49·22	50·11
	F. 201	103	51·24	
Mongoloids	M. 91	51	56·04	54·59
	F. 96	51	53·13	
Control population	M. 424	126	29·72	28·29
	F. 435	116	26·67	
University students	M. 126	29	23·02	22·06
	F. 78	16	20·51	

Discussion.—Statistically there is a significant difference between the mental defectives and the control population in the mean ridge counts and low-count frequencies, although the data are not sufficient to establish one between the students and the control population. Therefore it seems reasonable to suspect that there is some association between the *a-b* ridge count and the mental development. If so, the relationship must be traced to the very early embryonic stage. If the genetical factors for low counts have some inhibiting property, directly or indirectly on the ridge count, that property may also have some influence on the early development of the brain. Or, put in another way, since the action of genes has been shown to be mainly on the developmental processes and not directly on the characters themselves, it might be inferred that the developmental process responsible for low counts in the early embryonic stage, some time before or during the third embryonic month (since the epidermal ridges first appear in the third foetal month), may at the same time, under certain conditions, also affect development of the brain. We must, however, hasten to add that it is not suggested that a person with low count has necessarily low intelligence. The hypothesis is that the genes for low count might have created a less favourable physiological condition for the normal brain development. In other words, the genes in question are most probably only a contributory factor to mental deficiency.

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PHYSIOLOGICAL INSTABILITY IN CHILDREN.*

By G. D. Morgan, M.A.Cantab., M.R.C.P.

I am indebted to you for giving me this opportunity to put before you certain tentative conclusions at which I have arrived as a result of working at the problem of physiological instability on a group of 525 children between the ages of 6 and 14. Like so many investigations of this type, it began on a presumption that was not borne out by further experience, and because of this it caused me to revise certain views I held on the subject.

I started the work believing that there was a well-defined group of physiologically unstable children who could be distinguished from physiologically stable children and regarded as a particular constitutional type. At the time I believed these children approximated to the Kretschmerian schizoids. After I had used a stereotyped procedure, including recording body measurements in this and two other investigations over a period of three years, I abandoned this hypothesis in favour of the point of view now put forward by Sheldon. It is possible to pick out certain individuals and to regard them as examples of an extreme physical type, or as having a high level of physical stability or instability. There is no well-defined group, however, which can be regarded as containing a definite clinical entity. In fact, if a sufficient number of individuals are assessed in respect of any characteristic or collection of characteristics, when the results are plotted and examined it is unlikely that any special groupings will be revealed.

I propose to begin by describing the background of the work, then to give you an account of the stages by which it developed and the reasons why I was compelled to abandon the original theory and, finally, to discuss certain of the tentative conclusions at which I have arrived and the bearings they appear to have on certain problems of psychiatry.

The work began when I was engaged in neurological hospital practice. I was conducting the physical examination of children attending the West End Hospital's Child Guidance Unit. I was impressed by the close association between mental ill-health and physical debility, particularly in children and in later adult life. Many of the children I examined appeared to belong to the so-called allergic diathesis, and it seemed to me at that time a statistically significant group of them were Kretschmerian schizoids. At the time in question certain of my colleagues were seeking to establish as a clinical entity the pre-schizoid child, and the fact that many of these children appeared to belong to this group acted as an incentive to take my inquiries further.

These observations naturally awakened my interest in the diagnosis of schizophrenia, and in the differential diagnosis between neurosis and psychosis.

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I discussed the problem with a number of psychiatrists. At that time most of them took the view that neurosis and psychosis were two distinct disease entities. Nevertheless, whereas they described a number of symptoms of which they made a differential diagnosis, they were unable to give a simple differential pathology.

I was well aware that a neurologist was able to make his diagnosis at the post-mortem if at no other time. The psychiatrist, I discovered, by virtue of the nature of the diseases under his observation, could not confirm or refute his diagnosis even after death, and he was frequently committed to changing the label he applied to his patients during the time in which they remained under his observation.

In 1935 the London County Council offered me the direction of one of the five nutrition centres they were opening in the School Medical Service as a result of Sir John Boyd Orr's statements about the state of nutrition of the English population. They were established to ascertain whether or not this alleged state of sub-nutrition did in fact exist among a representative section of the London school-children.

The clinics were given a second function. Experience had shown that many children below the average standard of health, when referred by the school doctor to the hospital pediatrician, were referred back to them as free from disease. These children were also sent to the clinics to discover whether or not they were suffering from a state of sub-nutrition and, if not, to be investigated with a view to discovering the cause of their debility.

It will be seen that from the nature of the inquiry the children referred were not an unselected group from the community. This fact from the standpoint of my investigation had both its advantages and its disadvantages. The group cannot be used to establish any norm for the general population. Any deduction made from it, therefore, can only be regarded as applying to the limited group selected in this particular manner. Nevertheless, the method of selection brought to the clinic a large number of children suffering from the particular conditions in which I was interested. It presented these conditions more frequently and therefore more clearly than at the routine examination of children in schools, or for that matter in the examination of a group of sick children attending a hospital outpatients.

Before opening the clinics a conference was held between certain of the County's medical administrators and the five physicians who had been appointed to take charge of them and a standardized form of inquiry was drawn up. Arrangements were made to place at the disposal of the physicians facilities for pathological investigations and for the hospitalization and convalescence of the children. The physicians were also granted other facilities through which the diet of the children could be supplemented, if necessary substantially altered, and the living conditions changed. In fact, as experience later revealed, it was possible through these many facilities, when necessary, to alter the course of a child's life quite materially.

In 1935 little or no work of this type had been done either in England or abroad. Therefore it was not possible to borrow and use a ready-made technique. I personally began by using almost unmodified the form that had been devised before the clinics opened. By the end of 1936, however, I standardized a procedure and used it in respect of every child referred to the clinic

In this way a record was kept in the case of each child of the presence or absence of the characteristics in which I was interested. Some details of the procedure are given on sheet 1. It divides itself roughly under five headings :

(*a*) Details as indicated on the nutrition centre forms.

(*b*) History with dates and a note as to degree of severity of specific illnesses and operations, with special reference to bronchitis, recurrent bronchitis, rheumatism and the acute exanthemata.

(*c*) History of the manifestations of physical and psychological instability.

(*d*) Routine medical examination of the child.

(*e*) Standardized body measurements.

SHEET 1.

STANDARDIZATION PROCEDURE ADOPTED IN 1936.

History.

(*a*) Details as indicated by nutrition centre forms. (Copies to be circulated.)

(*b*) History with dates and note as to degree of severity of specific illnesses and operations, with special reference to bronchitis, recurrent bronchitis, rheumatism and the acute exanthemata.

(*c*) History of the manifestations of physical and psychological instability, including bilious attacks, tram/train sickness, headaches, migraine, asthma, heat bumps, urticaria, eczema, colonic spasm, lienteric diarrhoea, angio-neurotic oedema, chilblains, Raynaud's syndrome, Milroy's syndrome, epilepsy, fainting, enuresis (nocturnal, diurnal), incontinence, nail-biting, nightmares, sleep-walking, tics, blepharitis, dermatitis.

Examination.

(*d*) Routine medical examination of each child, including an assessment of such body responses as dilatation of pupils, dermatographia, erythema, blushing, urticaria, habit spasms and nervous movements, cold or hot extremities, perspiration, chilblains, nail biting, neuro-cardiac instability, dermatitis, blepharitis.

(*e*) Standardized body measurements including height and weight ; circumference of head, neck and chest, expiration, inspiration, abdomen, pelvis, palm and calf ; length of hand and leg.

Various factors led me to take a history of this type. Children whom I had seen during the year fell roughly into three groups :

(*a*) children who came from poor homes in which they received inadequate care, an inadequate diet and little or no attention ;

(*b*) children who had had a severe acute or chronic debilitating illness and had never been adequately convalesced ; and

(*c*) children who showed marked physical or psychological instability, or both.

This third group, which included at least a third of the children referred to the clinic, were similar in constitution to those I had particularly noticed at the West End Hospital Child Guidance Clinic.

At the time when I adopted this procedure I still believed that the pretubercular, pre-rheumatic child and the pre-schizoid child were one and the same person, and I was hoping to collect evidence to establish this as a mind-body diathesis with its foundations in the inheritance.

By 1938 I had used this method of investigation in two other inquiries as well as at this clinic and I had examined over 600 children ; and it began to dawn on me that the hypothesis from which I had started—that there was a clinical entity, " the unstable child "—was, in fact, not valid. This made it necessary for me to evaluate the work in a different way to that I had anticipated. The problem became a more complex one, and I felt the need to extend the range of my investigations.

In 1938 I added to the standardized procedure a teacher's estimate of the temperamental characteristics of each child seen at the clinic. The teacher was asked to express his opinions freely about the child, and at the same time to underline one or other of a list of opposite characteristics, whenever he was of the opinion that one of them applied to the child in question. In this way I hoped to get some information about various emotional factors which appeared to me to be related to the physiological instabilities.

In 1939 the London County Council granted me the assistance of a biochemist and the facilities of his laboratory, and I was planning to try and discover whether or not, by the careful selection of cases of extreme instability and extreme stability, it would be possible to bring to light underlying biochemical differences. At the same time I made arrangements to take clinical photographs and cinematographic pictures. The work had to be abandoned, however, on account of the war. I mention these potential developments in that they would all appear to be essential when work along these lines is repeated in a more highly systematized manner.

The stage of development of this work will only allow me to place before you certain tentative conclusions. Many of these can be seen through sheets 3 and 4 of the folders that have been distributed.

SHEETS 3 AND 4.

STATISTICAL ANALYSIS OF CERTAIN RESULTS.

Sheet 3 (boys) and 4 (girls) contain a statistical analysis of certain results :

Column A contains A1, incidence of each characteristic in total group of children, and A2, the percentage incidence of certain characteristics in the total group.

In the following columns the frequency is given of each characteristic in the group of children who have one of the specified characteristics :

Under B1 is given the frequency with which the various characteristics turn up in those children for whom there was a history of periodic vomiting. Under B2 is given the percentage incidence of certain characteristics to the total number of children suffering from periodic vomiting. Under B3 is given the percentage incidence of such characteristics among the remaining group of children after excluding those suffering from periodic vomiting.

Under C1, 2, 3 dermatographia is dealt with in this manner.

Under D1, 2, 3 severe examples of dermatographia are dealt with.

Under E1, 2, 3 cases of recurrent bronchitis and pulmonary catarrh (cases in which the so-called allergic factor would appear to be dominant).

Under F1, 2, 3 cases of colonic spasm.

Under G1, 2, 3 cases of nocturnal enuresis.

Under H1, 2, 3 habit spasms and nail biting.

SHEET 3.—*Boys.*

	group. A.207.		vomiting. B.79.			Dermatographia. C.126.			dermatographia. D.41.			bronchitis. E.49.			spasms. F.31.			G.48.			H.55.		
Constipation	14	6	8	..	..	8	..	..	..	..	..	4	..	..	3	..	..	7	..	..	5	..	..
Headaches	36	17	24	30	10	25	..	..	12	..	..	15	..	..	14	..	..	9	..	..	15	..	..
Tram sickness	47	22	27	34	17	33	..	..	10	..	..	14	..	..	8	..	..	7	..	..	16	..	..
Periodic vomiting	79	38	..	..	..	58	..	..	19	..	..	30	..	..	24	..	..	21	..	..	29	..	..
Chilblains	28	13	18	23	13	17	..	..	7	..	..	6	..	..	8	..	..	11	..	..	11	..	..
Heat bumps	52	..	27	..	..	39	..	..	14	..	..	21	..	..	12	..	..	11	..	..	17	..	..
Lienteric diarrhoea	8	..	6	..	..	7	..	..	2	..	..	4	..	..	7	..	..	2	..	..	3	..	..
Colonic spasms	31	15	24	30	6	24	..	..	7	..	..	13	..	..	..	..	..	10	..	..	13	..	..
Fainting	11	..	8	10	23	9	..	..	6	..	..	2	..	..	3	..	..	2	..	..	3	..	..
Bed-wetting	48	23	21	26	21	33	..	..	11	..	..	14	..	..	10	..	..	..	..	..	12	..	..
Migraine :																							
Definite	6	..	6	7·5	0	6	..	..	4	..	..	1	..	..	3	..	..	2	..	..	3	..	..
Doubtful	3	..	3	3·8	0	2	..	..	0	..	..	2	..	..	1	..	..	1	..	..	2	..	..
Bronchitis :																							
(1) In infancy	44	..	20	..	..	31	..	..	7	..	..	..	..	..	6	..	..	11	..	..	12	..	..
(2) Recurrent	49	..	30	38	13	39	..	..	13	..	..	..	..	..	13	..	..	13	..	..	20	..	..
(3) Total	93	..	50	..	..	70	..	..	20	..	..	..	..	..	19	..	..	24	..	..	..	..	..
Pulmonary catarrh	33	16	22	28	85	29	..	..	8	..	..	..	..	..	9	..	..	10	..	..	13	..	..
Asthma	7	..	7	..	..	5	..	..	2	..	..	6	..	..	2	..	..	1	..	..	4	..	..
Blepharitis	14	..	1	..	..	8	..	..	2	..	..	2	..	..	1	..	..	3	..	..	5	..	..
Dermatitis	21	..	7	..	..	11	..	..	2	..	..	5	..	..	5	..	..	8	..	..	3	..	..
Nail-biting	46	22	23	29	13	36	..	..	11	..	..	16	..	..	10	..	..	7	..	..	..	..	..
Habit.spasms	14	..	5	..	..	12	..	..	5	..	..	4	..	..	3	..	..	5	..	..	..	..	..
Dilatation pupils :																							
Slight	65	..	27	..	..	43	..	..	17	..	..	20	..	..	16	..	..	13	..	..	21	..	..
Severe	23	..	13	..	..	15	..	..	5	..	..	5	..	..	5	..	..	6	..	..	6	..	..
Blushing :																							
Slight	42	..	16	..	..	27	..	..	10	..	..	9	..	..	8	..	..	9	..	..	16	..	..
Severe	7	..	2	..	..	4	..	..	2	..	..	3	..	..	1	..	..	3	..	..	5	..	..
Dermatographia :																							
Slight	85	..	39	..	..	..	..	..	..	..	..	26	..	..	17	..	..	22	..	..	30	..	..
Severe	41	..	19	24	17	..	..	..	..	..	..	13	..	..	7	..	..	11	..	..	14	..	..
Erythema :																							
Slight	35	..	4	..	..	27	..	..	6	..	..	5	..	..	5	..	..	11	..	..	8	..	..
Severe	59	..	27	..	..	48	..	..	22	..	..	17	..	..	8	..	..	21	..	..	20	..	..
Neuro-cardiac :																							
Slight	39	..	15	..	..	30	..	..	12	..	..	15	..	..	6	..	..	10	..	..	14	..	..
Severe	10	..	9	..	..	9	..	..	4	..	..	0	..	..	2	..	..	3	..	..	3	..	..
Kyphosis	8	..	2	..	..	6	..	..	1	..	..	0	..	..	1	..	..	2	..	..	3	..	..
Scoliosis	8	..	2	..	..	6	..	..	3	..	..	1	..	..	0	..	..	1	..	..	3	..	..
Rachitic deformity chest :																							
Slight	96	..	51	..	..	68	..	..	20	..	..	30	..	..	16	..	..	26	..	..	31	..	..
Severe	18	..	7	..	..	13	..	..	7	..	..	3	..	..	3	..	..	2	..	..	3	..	..
Total	114	55	58	72	44	81	62	40	27	63	53	33	64	52	19	60	54	28	58	52	34	61	53

SHEET 4.—*Girls.*

	Total group. A.204.		Periodic vomiting. B.60.			Dermatograhpia. C.130.			Severe dermatographia. D.32.			Recurrent bronchitis. E.26.			Colonic spasms. F.28.			Nocturnal enuresis. G.48.			Habit spasms. H.68.		
Constipation	29	14	15	..	..	22	..	..	9	..	..	4	..	..	6	..	..	6	..	..	10	..	..
Headaches	31	15	14	23	11	18	..	..	7	..	..	5	..	..	5	..	..	7	..	..	12	..	..
Tram sickness	74	36	36	60	16	51	..	..	19	..	..	12	..	..	14	..	..	19	..	..	27	..	..
Periodic vomiting	60	29	..	..	..	43	..	..	10	..	..	11	..	..	13	..	..	19	..	..	20	..	..
Chilblains	36	18	12	20	16	27	..	..	8	..	..	1	..	..	7	..	..	7	..	..	13	..	..
Heat bumps	48	..	16	..	..	31	..	..	8	..	..	8	..	..	11	..	..	11	..	..	20	..	..
Lienteric diarrhoea	6	..	3	..	..	5	..	..	0	..	..	3	..	..	3	..	..	2	..	..	4	..	..
Colonic spasms	28	14	13	22	10	18	..	..	6	..	..	6	..	..	4	..	..	8	..	..	11	..	..
Fainting	15	..	8	13	5	8	..	..	3	..	..	1	..	..	4	..	..	3	..	..	6	..	..
Bed-wetting	48	23	18	30	21	25	..	..	7	..	..	7	..	..	8	..	..	..	..	..	18	..	..
Migraine:																							
Definite	3	..	2	3·5	0·7	2	..	..	..	..	..	1	..	..	1	..	..	1	..	..	1	..	..
Doubtful	3	..	1	..	..	3	..	..	1	..	..	0	..	..	1	..	..	0	..	..	0	..	..
Bronchitis:																							
(1) In infancy	68	..	16	..	..	42	..	..	10	..	..	..	..	..	13	..	..	12	..	..	24	..	..
(2) Recurrent	23	..	10	17	9	13	..	..	2	..	..	..	..	..	4	..	..	7	..	..	10	..	..
(3) Total	91	..	26	..	..	55	..	..	12	..	..	..	..	..	17	..	..	19	..	..	34	..	..
Pulmonary catarrh	14	7	5	8	6	12	..	..	3	..	..	..	..	..	3	..	..	2	..	..	10	..	..
Asthma	7	..	5	..	..	5	..	..	1	..	..	2	..	..	3	..	..	1	..	..	4	..	..
Blepharitis	15	..	5	..	..	9	..	..	0	..	..	1	..	..	3	..	..	6	..	..	5	..	..
Dermatitis	19	..	8	..	..	13	..	..	1	..	..	5	..	..	3	..	..	4	..	..	5	..	..
Nail-biting	59	29	14	23	30	38	..	..	10	..	..	8	..	..	8	..	..	19	..	..	..	..	..
Habit spasms	12	..	5	..	..	7	..	..	1	..	..	3	..	..	4	..	..	4	..	..	..	..	..
Dilatation pupils:																							
Slight	76	..	29	..	..	54	..	..	10	..	..	10	..	..	6	..	..	19	..	..	27	..	..
Severe	20	..	7	..	..	15	..	..	9	..	..	4	..	..	6	..	..	5	..	..	7	..	..
Blushing:																							
Slight	42	..	12	..	..	30	..	..	10	..	..	5	..	..	7	..	..	7	..	..	18	..	..
Severe	9	..	2	..	..	10	..	..	9	..	..	4	..	..	2	..	..	4	..	..	5	..	..
Dermatographia:																							
Slight	94	..	35	..	..	..	..	..	..	..	..	10	..	..	12	..	..	19	..	..	32	..	..
Severe	32	..	12	20	14	..	..	..	3	..	..	5	..	..	7	..	..	7	..	..	11	..	..
Erythema:																							
Slight	52	..	13	..	..	36	..	..	14	..	..	6	..	..	2	..	..	14	..	..	15	..	..
Severe	35	..	16	..	..	36	..	..	15	..	..	6	..	..	9	..	..	11	..	..	14	..	..
Neuro-cardiac:																							
Slight	43	..	10	..	..	30	..	..	13	..	..	5	..	..	7	..	..	10	..	..	22	..	..
Severe	7	..	2	..	..	5	..	..	1	..	..	3	..	..	2	..	..	4	..	..	1	..	..
Kyphosis	20	..	4	..	..	13	..	..	4	..	..	2	..	..	2	..	..	5	..	..	6	..	..
Scoliosis	23	..	8	..	..	18	..	..	13	..	..	4	..	..	3	..	..	4	..	..	4	..	..
Rachitic deformity chest:																							
Slight	82	..	35	..	..	48	..	..	18	..	..	12	..	..	7	..	..	14	..	..	25	..	..
Severe	11	..	12	..	..	8	..	..	1	..	..	1	..	..	1	..	..	5	..	..	3	..	..

1. The children referred to the clinics showed an unexpectedly high incidence of a number of instabilities. Over 30 per cent. had periodic vomiting; about 15 per cent. gave a history of recurrent attacks of colonic spasm. Nearly 25 per cent. gave definite evidence of neuro-cardiac instability. In spite of the fact that all the children were under the age of 14, 9 gave a definite history of migraine, and 6 others a strongly suggestive history. Fourteen gave a history of asthma.

The group also showed a high incidence of recurrent bronchitis, and in many of these there was little doubt but that a so-called allergic factor played an important part in the recurring attacks. Over 18 per cent. had recurrent bronchitis, and in about two-thirds of these cases the allergic factor appeared to be important.

Thirdly, deformities of the chest which are usually regarded as rachitic (although I do not know any evidence to establish whether or not these deformities develop in the first years of life or throughout childhood) were severely present in over 14 per cent., and occurred in 55 per cent. of the cases.

From this it would seem that if doctors are asked to select cases of subnutrition or debility from among the school population, they automatically include a large percentage of those suffering from (*a*) physiological instabilities, (*b*) minor recurrent infections, and (*c*) deficiency diseases.

Then again 23 per cent. of the cases gave a history of bed-wetting, 25 per cent. evidence of nail-biting and about 6 per cent. of habit spasms. These facts, together with the previous ones, suggest that a high percentage of these children would find their way to the Child Guidance Units if the opportunity presented itself. In fact, at the present time the function of these two clinics overlaps, and there would appear to be an urgent need for them to function under the same roof and in close association.

It is interesting to notice two differences between the sexes, although it would be incorrect at this juncture to draw any deductions from them. The number of girls suffering from constipation is precisely double the number of boys.

Secondly, whereas throughout the list of instabilities there is either equality between the sexes or a slightly higher incidence among the boys, in the case of bronchitis the figure for one or two attacks of bronchitis in infancy is much higher for girls than boys, yet the figure for recurrent attacks throughout childhood is much higher in boys than girls; and with these cases the allergic factor, as estimated clinically, would appear to be of greater importance in boys than girls.

2. I have regarded it as premature to work out the correlation between the incidence of these various instabilities in particular children. I have, however, worked out the percentage incidence of many of these instabilities in the group of children suffering from periodic vomiting, and the percentage incidence of these instabilities in the remaining group of children. On sheets 3 and 4, in the centre column under B, the percentage incidence of the various instabilities in the cases of periodic vomiting is given, and in the third column the incidence of these characteristics in the remaining group of children.

You will notice that differences such as 30 per cent. in the group who had periodic vomiting (group B) suffered from headaches, as against 10 per cent. in the remaining group ; 34 per cent. have tram sickness as against 17 per cent. ; 30 per cent. have colonic spasm as against 10 per cent. ; 10 per cent were subject to fainting as against 2·3 per cent. All the cases of doubtful and clinically definite migraine and all the cases of asthma suffered from periodic vomiting. In all these cases there would appear to be a positive correlation between periodic vomiting, on the one hand, and these various instabilities on the other. This group of instabilities appears to be significantly related in the case of girls, although, as throughout these investigations, the relationship between instabilities and between instability and physical type is more apparent in the group of boys than the group of girls. This has also been noticed by Sheldon.

The percentage incidence of severe dermatographia and severe erythema is slightly higher in the group who suffer from periodic vomiting than in the remainder of the children ; if there is a positive correlation, however, it is not a high one. These observations confirm the inter-relationship I have repeatedly observed clinically between periodic vomiting, train sickness, colonic spasm, fainting, migraine and asthma. On the other hand, they suggest that those children subject to severe blushing and other severe vaso-motor skin changes belong to a different body constitution, in which the association with ketosis would appear to be almost a matter of chance. Clinically, therefore, there are at least two independent groups of instabilities in children.

Of equal interest is the relationship between periodic vomiting and recurrent bronchitis—38 per cent. of the children who had periodic vomiting as against 13 per cent. in the remainder—and between periodic vomiting and chest deformities of the so-called rachitic type. In recurrent bronchitis there is a definite infective factor that is now known to clear up with penicillin inhalations. This observation, however, strongly suggests that the chances of successful invasion of the bronchi depend to a considerable extent upon constitutional and metabolic factors, and through these, in the second place, upon emotional factors.

A similar change of perspective is necessary in relationship to rickets. Whereas it has been customary to regard this condition as due to a vitamin deficiency together with a failure of the calcium-phosphorus balance, this investigation supports the point of view that it can be partly attributed to constitutional factors and is related to periodic vomiting. When a community is placed on a diet which is barely adequate in its mineral and vitamin content, this constitutional factor will determine which of the children will develop obvious deformities. In fact it would indirectly suggest that the constitutional factor responsible for periodic vomiting, migraine, asthma and recurrent bronchitis can be influenced by a change of diet—a matter clearly born out by clinical experience.

This became so apparent that I have come to regard constitution, diet, mild chronic infections and emotional factors as closely inter-related factors in the production of many clinical pictures. For this reason the treatments we have used are drastic changes of diet, convalescence of up to and more than one year, when necessary a change of school, or even the rehousing of the family. We also changed the methods by which the children were handled by re-education in the clinic, and through the work of a team of trained and voluntary social workers in collaboration with the teachers. The results of this work have shown the extent to which diet and behaviour patterns might well be classed among the hereditary factors in the sense that they are handed down from one generation to the next almost unmodified. Tradition can develop a permanence that rivals the permanence of the other products of human ingenuity such as houses and monuments.

3. The third question to which I would like to direct your attention is how these instabilities are distributed among this group of children, and the relationship between this distribution and the physical type of the child. The instabilities distribute themselves in a remarkably even manner. This is to be seen from sheets 3 and 4 in the Tables. I think I was in error in including bed-wetting in the vertical scale. The method of scoring I have used is somewhat arbitrary, but until a method based upon biochemistry or some other more exact measure is available it would seem the only starting-point through which to approach the problem. Tables I, II and III all suggest that the instabilities that have been recorded and scored do not group themselves, but spread themselves evenly between the two extremes of a high level of instability and its complete absence. There is, in fact, no such person as the unstable child, except as an abstraction. Every child, however, has his own particular instabilities or physical Gestalt, which can only be properly examined through a battery of investigations not dissimilar to those used by Eysenck in investigating personality.

There is a demonstrable relationship in the case of these boys between a high level of instability and the ectomorph of Sheldon. This was brought to light by a graph on which each boy was plotted twice, once in respect of his height and weight, and a second time in respect of the length of leg and the circumference of the chest. The boys whose instability score was severe, that is to say 4 or more on the vertical scale, distributed themselves towards the side of the graph that placed them among the thin children. The length and direction of the lines joining the two points which were plotted also show that they tend to be proportionately long in the leg. There is only a tendency, however, for children of this build to be unstable, and for unstable children to group themselves in this way; many of them do not conform to this finding, and in particular it was difficult to show the relationship between instability and physical type in girls. Clinically there would appear to be a clinically unstable group of girls among the endomorphs which have complicated the graph quite seriously. A great deal of further work requires to be done if these relationships are to be seen clearly.

When I attempt to evaluate this work I find starred out in my mind one child in whom there appeared to be an aggregation of misfortune—a tall, thin girl with periodic vomiting, later migraine, colonic spasms with intermittent diarrhoea. Her diet was deficient in minerals and vitamins and grossly excessive in starches, her home was overcrowded and dirty, with inadequate sleeping accommodation. The result was a child, in bed each

TABLES I, II AND III.

Estimated frequency with which physiological instabilities have turned up in individual children.

Tables I (Boys) and II (Girls).—

Horizontal Scale.

Clinical evidence of—	Scoring method. Severe.	Scoring method. Slight.
1. Blushing	2	1
2. Dilatation pupils	2	1
3. Dermatographia	2	1
4. Erythema	2	1
5. Neuro-cardiac instability	2	1

Vertical Scale.

History of—	Score.
1. Headaches	1
2. Tram sickness	1
3. Periodic vomiting	1
4. Chilblains	1
5. Heat bumps	1
6. Lienteric diarrhoea	1
7. Colonic spasm	1
8. Fainting	1
9. Bed-wetting	1
10. Asthma	1
11. Recurrent bronchitis	1

TABLE I.—*Boys.*

	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Total.
0	17	11	13	2	7	4	1	..	1	..	..	56
1	12	9	6	10	4	3	2	..	..	..	..	46
2	3	8	3	6	9	6	5	2	..	..	..	42
3	3	6	3	3	3	3	..	2	1	..	..	24
4	1	3	3	3	4	3	2	1	..	..	..	20
5	..	2	1	3	..	3	..	1	..	..	..	10
6	..	..	3	2	1	..	1	1	..	..	..	8
7	..	1	..	..	..	..	1	..	..	..	..	2
Total	36	40	32	29	28	22	12	7	2	..	..	208

TABLE II.—*Girls.*

	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Total.
0	9	15	8	7	4	1	..	..	..	..	1	45
1	9	8	6	16	3	4	2	1	..	..	..	49
2	6	7	12	6	8	2	4	2	..	..	..	47
3	4	2	5	11	5	2	..	1	1	2	..	33
4	1	4	3	2	7	2	1	..	1	..	1	22
5	1	3	..	..	..	1	..	..	..	..	..	5
6	..	2	..	1	..	..	..	..	1	..	..	4
7	..	..	..	..	..	..	..	..	..	..	..	..
Total	30	41	34	43	27	12	7	4	3	2	2	205

TABLE III.—*Totals of Vertical and Horizontal Scales.*

	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
Boys	17	23	25	19	27	20	21	15	20	7	8	2	2	2	..
Girls	9	24	22	24	35	20	29	13	14	5	4	1	3	..	2
	26	47	47	43	62	40	50	28	34	12	12	3	5	2	2

TOTAL: Boys 208, Girls 205 = 413.

winter with bronchitis, developing a marked deformity of the chest with marked scoliosis and kyphosis; intermittently when her diet gave rise to ketosis she was extremely irritable, and rebelled vigorously with tempers and sulking against parents and teachers. Her picture could only result from an aggregation of a number of independent factors, but nevertheless is known to me as an outstanding example of a definite clinical entity. She spent a year in a carefully controlled country environment on a regulated diet and returned a different child, although we had to continue to regulate her life to prevent her relapsing. This history is now familiar to us all as the background of many of our physically and mentally ill adult patients.

Most of us were brought up to believe that one disease meant one pathology and, therefore, one cause. This point of view appears to work excellently when considering a disease like pneumonia, and led to striking chemo-therapeutic advance. It worked less well with asthma, recurrent bronchitis, migraine and mucous colitis, and has proved unhelpful in the study of mental illness. I have found it quite bankrupt in work in a clinic of the type of this survey.

This survey, therefore, represents part of a general trend in medicine which is of outstanding importance to the psychiatrist. Professor Himsworth has pointed out that the physician is now compelled to think in a different way. Each disease entity is the product of multiple factors operating within the individual and within his society. These individual factors are very different from the end-result which they produce. Their association is sometimes causal and at other times accidental. Nevertheless, it is only by the study of the contribution made by each of them that the end-result is to be understood.

I have found that a psychophysical approach of this type to the problem of mental ill-health has a high clinical and therapeutic value.

DIFFERENTIAL DIAGNOSIS OF SOME EMOTIONAL DISORDERS OF ADOLESCENCE (WITH SPECIAL REFERENCE TO EARLY SCHIZOPHRENIA).*

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In my student days, after the first world war, teachers and text-books still used the term dementia praecox. It was looked upon as a disease *sui generis*, and descriptions were entirely in terms of clear-cut asylum cases with the usual classification into simple, hebephrenic, katatonic and paranoid. There was no psychopathology worth noting, and no anticipation of the immense gap waiting to be explored between "normality" and complete mental breakdown. In effect this meant that there was no half-way house in diagnosis: it was either dementia praecox or nothing. The revolutionary change in diagnostic approach began with Bleuler's highly original conception of the disorder as a progressive splitting of the psyche, indicated by the name schizophrenia which he gave to it, and which now holds the field. Added to this there are the researches of the psycho-analytical schools (the Jungians in particular) which have succeeded in opening up a huge and fascinating borderland on the fringe of normality, with a corresponding enlargement of our notions of schizophrenic disorders.

I am afraid, however, that in many quarters even to-day the change from dementia praecox to schizophrenia is not much more than an alteration in nomenclature, with no corresponding change in understanding. It shows up on occasion rather painfully when the mental hospital medical officer without much extramural experience is called upon to take the psychiatric O.P.'s, say, at a general hospital. I feel that so often in a certain type of case he is still limited in diagnosis to schizophrenia or "nothing"—just a new wording of an old diagnosis.† Here is the sort of thing that can happen:

Case 1.—A well-grown girl of 16½ was sent by her doctor to psychiatric O.P.'s because of her very poor and irregular performance at work, apparently due to long spells of day-dreaming. There were further complaints from home of "always a dreamy solitary girl, easily upset, needing constant urging to do anything . . . will lie in bed all day . . . reading comic papers or novels . . . no friends," and so on.

The psychiatrist, an M.O. from the nearby mental hospital, could only think of an incipient schizophrenia, though the patient was far from psychotic and her mental state did not warrant any such diagnosis. As she had been under my care at the Child Guidance Clinic a year or two previously he asked me to see her again.

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* A Paper read to the Spring Meeting of the Northern and Midland Division at Lincoln, April, 1949.

† Under diagnosis Henderson and Gillespie write, "The principal condition from which schizophrenia has to be differentiated is the manic-depressive psychosis" (fifth edition, p. 241). There is no mention of the other states I will call attention to in this paper.

Our records showed that she had been referred to us at 14 on account of her withdrawn unco-operative attitude at school, an attitude which her mother told us had characterized her behaviour right through her childhood. We had found her to be dull and slow intellectually (I.Q. 88); emotionally she was anxious and depressed, being most concerned at her inability to keep up with the others in school. She attended over a long period for treatment with considerable benefit, being discharged just before she left school for work, a happier, more outgoing child.

At this second referral it was seen that she had relapsed to pretty much the same mental state as when first treated at 14. The picture was of a dull, slow adolescent being pressed beyond her pace at work, and defending by a passive obstinacy (very obvious at home) and a withdrawal into compensatory day-dreaming. Significantly, when questioned she gave as her principal fantasy "That I could do more than the other girls"—very much in keeping with her anxious depression earlier when she fell behind in school.

One thing stood out quite clearly: the continuity of her character and the identity of her reactions under analogous conditions. On each occasion she responded in the same characteristic way to the same kind of stress, and the diagnosis of simple maladjustment due to real inferiorities of endowment was borne out by her response when changed to easier and more interesting work. At no time was there any evidence of any schizophrenic thinking or symptom formation, nor yet of any schizoid background on which the disorder might grow.

The cry in medicine to-day is for early diagnosis and treatment. This is all to the good, but we must be alive to the difficulties of such a programme. Asking for patients to consult us early means we shall see more and more cases like the above from the vague borderland on the fringe of normality, and our powers of discrimination and differentiation must be accordingly increased. Again, whereas the therapeutic attack may be straightforward in the well-established case of schizophrenia, what does one do in therapy before the condition has unequivocally declared itself? (Too much of our "keeping cases under observation" means doing nothing till the diagnosis is obvious.) This altogether apart from how to handle those we attract to our clinics who are not, and never become psychotic, and have no place in mental hospital treatment. Early and preventive psychiatry must be largely extramural, and now that the (new) psychiatrist has peeped out of the seclusion of his mental hospital, he must be taught to meet many conditions for which his previous training has hardly prepared him. Even the "straight" psychoses in these early stages may look very different from their present text-book descriptions.

Schizophrenic disorders notoriously originate during adolescence, and it is amongst the emotional disorders of this period that we must look for the clinical onset of our early cases. It should be remembered, however, that adolescence is normally an age of emotional turmoil and instability, and much that would be classed as pathological in later adult life may prove to be but a temporary exaggeration of normal trends of character, and not necessarily the harbinger of a psychosis. The degree of mental pathology which may be exhibited with subsequent complete recovery is quite surprising.

Case 2.—The parents of a young girl of 16 consulted me in a state of some alarm. The Head Mistress of the girl's boarding-school had written euphemistically that she was "not too well," and suggested she would be better for a week or two at home. On arrival she began talking queerly about "losing her memory" and "going mad"—a quite justifiable cause for the parental alarm.

The girl herself was an anxious, rather immature child of asthenic build. She described various inferiorities that had troubled her at different times since first going to the boarding-school some 12 months previously. But altogether she had managed to hold her own till a couple of weeks ago. Then, to use her own words :

" I felt a cold coming on . . . wanted to lay down . . . lazy . . . didn't feel like doing anything . . . just lay in bed . . . ridiculous thoughts passed through my mind . . . compulsive—' You've always wanted to know what its like to be dead, now you know.' . . . I thought I was going mad. . . . I was very frightened. . . . Next day in school I was in a daze and couldn't do anything."

The attack lasted the whole week, till she came home in fact, during which time she had restless disturbed nights and vaguely confused days. She had other complaints when I saw her, which included :

" I don't feel like other girls . . . I don't think I'm developing like them in mind and body . . . feeling out of it. I can't make up my mind about anything . . . I've no real feelings at all ! . . . I've lost interest, etc."

Altogether not a happy picture, and one demanding a guarded prognosis.

I saw her at intervals, some half-a-dozen times, for therapeutic conversations. The mental disturbance slowly cleared up and after about six weeks had disappeared. After another month of satisfactory stability she ceased attending.

Nearly two years later she asked to come and see me again, ostensibly for advice about her career. (She was taking elocution and music and getting on quite well.) Her complaints and doubts seemed objective enough, and, though there was some tension and a little undue anxiety, there was nothing of the nature of her previous symptomatology, and I reassured her parents accordingly. A fortnight after this she woke up during the night in an acute panic and wanted to speak to me at once. Her chief anxiety was about her masturbation, but as we had gone over all this before it could not have been the real cause of her extreme agitation (Before she could be calmed down *both* parents had to sleep with her !) The panic brought on symptoms reminiscent of her first attack though not by any means as pronounced, and after a week they gradually subsided and disappeared with rest and sedation.

I have not seen her now for about 18 months and, as she will be approaching 20, I am hoping she has achieved a reasonably stable maturity.

Here, by contrast, is a case that took the opposite turn :

CASE 3.—I first saw John, aged 17, in 1947. He had just failed in his school certificate, and I was asked primarily to advise about his further education ; there was a secondary complaint of attacks of awkward behaviour due to irrational fears on one or two recent occasions.

He was a tall, lanky youth who talked freely, but rather vaguely and with limited insight, about his pretty obvious retreat in the face of difficulties. His drawing (for which he had quite a talent) and his conversation revealed a decidedly introverted character, of a soft, easy, almost effeminate kind. More specific were his two recent attacks when his behaviour definitely overstepped the bounds of normality. The boy himself described ideas of reference with all the peculiar detachment of the schizoid :

'I couldn't sleep . . . thought people weren't friendly. . . . Not much to it. My imagination ran away with me—*I imagined people watching me*: not sure of my facts . . . things seemed peculiar . . . you get all muddled up."

He was taken on for regular psychotherapy, and in spite of the usual difficulties owing to his markedly introverted nature he co-operated well and with great benefit to himself. After about 6 months I was able to report great improvement ; he was attending the local Art School and doing well. Most unfortunately just about this time his father, to whom he was very attached, went down with a very serious illness and the boy relapsed completely. Psychological treatment was resumed but I was never able to get the same rapport again. He managed to carry on irregularly at school, and with odd patches at home, for another 3–4 months before he finally broke down completely with a frankly schizophrenic outburst which made me advise mental hospital treatment. When last heard of he was responding well to insulin therapy.

To complete a trio showing the uncertainties of prognosis in these cases, here briefly is one whose ups and downs have left me quite puzzled as to the ultimate outcome :

CASE 4.—Audrey was working at the telephone exchange, where she heard the girls talking about V.D. " I got an idea that I'd got it . . . I fainted . . . went home . . . I called myself hypocrite and coward." After staying in bed a few days she was a little better. But the ideas kept recurring each time she had a menstrual period. (The hospital doctor called it " hysteria " and it was left at that.)

A year later, now aged 17, she left the job and went in for teaching—training at a residential college. She was there only one week when she asked to be brought home because she had begun to think the girls were laughing at her. She was just 18 by the time I saw her (November, 1945), and at the first consultation she talked of—

" Ideas charging round inside my head—I've got it into my mind that they don't want me at home " (but knows this not true). " *My mind doesn't work in conjunction with my body.*"

There were other symptoms of an intermittent nature, the sum total of which was to make me prepare the parents for a schizophrenic breakdown.

Less than 3 months later the picture had changed with startling rapidity. She was bright, almost radiant, and had put on weight. All her " queer ideas " had gone, and she was so much better that she had begun as a help at an infants, school and liking it immensely.

Unfortunately it didn't last, and a bare two months after that I was consulted again for a recurrence of symptoms. This time she was quite dazed and confused and I could hardly get her to talk. At one point she echoed my laugh in the classical pathological manner. She still had some insight, viz., she agreed she has funny, ideas but added, " I don't know which are funny and which are not."

Again she recovered, and after 6 months, during which time she was allowed to vegetate at home, she was quite well again. Recently (August, 1948) I received, quite unsolicited, a charming letter from her reporting progress. After leaving me she had found congenial work in a bookshop. There were occasional setbacks but only very slight ones, and taken early, a day or two in bed put her right. She has now married, and according to her letter is happily settled.

These three cases should give us much cause for thought, and I should like to place them in their proper context amongst the emotional problems of adolescence, about which we are increasingly consulted nowadays, especially through the Child Guidance Clinic. I know of no previous attempt at classification of the cases (*cf.* note, p. 960), and would tentatively suggest a broad grouping as follows :

A. *Maladjustments Arising out of Personality Defects or Difficulties of Character.*

(1) *Real inferiorities of endowment.*—Intellectual or emotional dullness : severe emotional immaturity.

(2) *Extreme temperamental variations.*—The grossly introverted character.

(3) *Shy withdrawn characters,* with feelings of inadequacy or inferiority and evident internal conflict. Family tensions much in evidence, particularly with one or other parent.

B. *Psychological Illnesses of Adolescence.*

(1) The neuroses—mostly anxiety states of varying degrees of severity. Sometimes a continuation or a recurrence of the obsessional states of early childhood.

(2) Panic reactions.

(3) Early schizophrenia.

Before going further I want it to be understood that the classification above does not mean that we are dealing with some half-dozen clear-cut mental states rather like the diseases of clinical medicine. There is more even than overlapping of the various types. For the most part there is a continuous series in every direction, so that one passes insensibly from one type to the next, through the mixed and borderline cases. Nevertheless, it is useful to have in mind some theoretically " absolute " picture of the pure case as a kind of axis round which to group one's clinical material.

To take the items of the above classification in order. People there are with innate handicaps which reduce their performance and their capacity for adaptation. Case 1 briefly describes such a girl, whose limited mental endowment and general slowness was the source of her retreat from the severities of everyday life into the compensatory world of fantasy. In the event she was mistaken for an early schizophrenia.

Another common error is to mistake the grossly introverted (schizoid) character for the mental illness. The introversion-extraversion scale gives one dimension of personality, and at the extremes of the scale, particularly at the end of extreme introversion, one meets with people who by ordinary social standards are, to say the least, peculiar. But only in the same way that an unusually tall or very short person is peculiar ; eccentric they may be, but not psychotic. Here is an outstanding example :

Case 5.—John R—'s parents described him as an " odd " boy with many erratic peculiarities of manner and behaviour. Solitary and asocial ; completely without friends or personal contacts ; only " external " interest is keeping rabbits. He would never respond to overtures from his parents or discuss his problems with them. He has spent hours in his bedroom all on his own. In company at home he is apt to 'act silly' instead of joining the conversation. He has always been absurdly faddy with food.

Nevertheless they saw no reason for serious complaint until he failed badly in his school certificate examination. On inquiry the school gave as the reason for his failure that he was "extremely slow in grasping new matter, in thinking, and in expressing himself at all " ; but not unintelligent.

The boy himself presented the picture of a completely introverted character to such a degree that one could barely make contact with him, let alone make an impression. He was at first ill at ease, with a facial twitch and perspiring freely. At times his lips moved as if muttering to himself. There was a long pause before he replied to questions, and sometimes he completely ignored them. He preferred not to talk if he could help it : for example, when I asked about his school progress he just took some school note-books out of his satchel and handed them to me without comment. I asked him what he thought of his progress. " That's not for me to say " was his answer.

In general he was suspiciously on the defensive and refused to commit himself or give an unequivocal opinion. There was a good deal of verbal fencing and playing with words which he seemed to enjoy, but nothing of a concrete nature. The outer social world hardly concerned him, and as for his inner world he implied that was his own affair. " It's not a secret, but I've more sense than to tell." (After winning one such " debating point " he gave a peculiarly unhealthy self-satisfied grin.)

Altogether his preoccupation with his inner thoughts, which he refused to disclose, was taking him more and more inside himself, and I have no doubt but that he was steadily developing into an eccentric schizoid character.

Extravagant bizarreries such as the above are fortunately rare, as rare as the extreme of introversion from which they grow. But, as already mentioned, adolescence is in the nature of things a period of emotional instability. Rapid development of new and powerful urges makes integration difficult ; conflict with one or other parent (or both) is almost the rule rather than the exception ; heart searching and introspection are inevitable, and the mental upheaval in cases suitably predisposed may come more or less to resemble a mildly schizophrenic picture, with which indeed it has close analogies and parallels. The usual story, and one very commonly heard, is of loss of self-confidence making for a withdrawal from social contacts and from work or school ; such symptoms as awkward shyness and self-consciousness, with marked feelings of inadequacy and inferiority, are much in the foreground.

I will not give a case in any detail (everyone must have come across these children), but will pick out some significant remarks made during treatment by an intelligent secondary schoolgirl of 16+ suffering from this kind of disturbance :

CASE 6.—In essence Connie had just downed tools and given up her education in the year of her School Certificate. But that there was some internal conflict going on was clear enough from her erratic behaviour. She had gone back to school after one withdrawal and worked hard ; then abruptly she walked out again one day. She was now becoming asocial and solitary. She had dropped all her friends, and at home would not help or do anything : she would just sit in a corner and read. She was irritable and resented interference, and hit back at her mother in her flashes of temper. (Incidentally a great deal of her problem was related to an open conflict with mother, who turned out to be a hard and unsympathetic woman.) None the less the girl was quite accessible and willing to be helped.

In the fourth session of psychological treatment she described a vague confusion almost like depersonalization (" It wasn't me—a queer detached feeling : most unpleasant "), and then proceeded :

" I get mixed up—there's so many of me.
" 1. Wants to be a good girl at home.
" 2. Cynical and bitter.
" 3. Ranting and roaring person.
" 4. Doesn't want to think at all.
" 5. Utterly childish.
" 6. Just desperate.
" 7. Wants to be comfortable in luxury."

She finished off with " I will end up in the madhouse. I'll be out of everyone's way." In spite of this and much like it, she made an excellent response to simple psychotherapy, and ultimately an excellent adjustment to work as a Nursery School teacher.

Different and distinct from these maladjustments arising out of personality defects or difficulties of character development, I have separated out a second group of reactions which I look upon more as psychological illnesses.

Anxiety states with symptoms in the adult style may be encountered in the later 'teens, though fully fledged examples are distinctly uncommon. The personality behind the symptoms here is very different from those heretofore. One meets a mature, *over*-responsible young man or woman : intelligently self-critical, striving hard, but finding work or school—and life generally—increasingly trying to cope with. Having kept his troubles to himself (i.e. as far as he knows what they are), the breakdown is all the more surprising to the family, and may come on them quite unexpectedly. Fortunately, however, the latter in general are quite understanding and sympathetic, and able to look upon the condition as the illness it is ; this in contrast to the previous type of case, where there is often a long history of barely concealed antagonism, working up to and culminating in the behaviour problem. The treatment is correspondingly different : whereas the behaviour problem can be handled by conversational methods directed to a reorientation of family relationships, the true neurosis needs a therapy more approximating to a proper psychological analysis (with free association, etc.). The same is true of obsessional states reappearing about this period.

For our purpose here, the important item to note is that in their heart-searching and self-questioning, cases of genuine neurosis may verbalize their mental conflicts in the manner of all adolescents without being at all schizoid. If this is borne in mind the true diagnosis is not likely to be overlooked. I must confess, however, that more than once in older patients I have been deceived in the reverse direction. What at first sight looked like a fairly severe anxiety state, later interviews showed to cover a latent schizophrenia, this particularly so in young adults in the early twenties.

Now for the last and most perplexing type of case to be differentiated from early schizophrenia. I have already given two examples (Cases 2 and 4), and have labelled them, for want of a better term, the "panic reactions." Here more than anywhere else does one feel the absence of clearly demarcated boundaries in psychological medicine, and it is a moot point whether we are dealing with a disorder different *in kind* from established schizophrenia, or whether (as I am inclined to believe) there is not a continuous series of steadily increasing severity from the mildest and most temporary panic reaction to the severest schizophrenic. I should say it is a matter of degree, largely of success or failure of integration, and I do not think one need involve any special or new psychopathology in those progressing to psychosis. (Note, for example, the fluctuations of Case 4, who undoubtedly was psychotic on occasion, and compare the remissions and relapses in established cases of schizophrenia.)

This last compares with the point of view adopted by Adolf Meyer and his school, which looks upon schizophrenia as "the outcome of progressive maladaptation of the individual to his environment. Schizophrenia is not a 'disease' but a congeries of individual types of reaction having certain general similarities." But for a full psychopathology we must go a little further, and bring in Bleuler's now classical notion of "splitting of the personality." This, the unique form of his withdrawal and the internal repercussions of his maladjustment, is *the* characteristic psychopathology of the schizophrene, which in advanced cases can bring about the complete disintegration of the ego and permanent dementia. In the earlier stages, however, the failing may first show as a lack of capacity to integrate *new* emotional drives and experiences. (Integration is a faculty that is normally so automatic as to be taken for granted, and only its failure demonstrates how little we know about it.) Because of the turmoil of new feelings, adolescence stands out as a period of particular difficulty in this respect, and many a precariously established internal balance, say, in a young person not very tolerant of new emotional experiences, suffers an explosive disintegration under the impact of the freshly awakened sex drives and all their concomitants.

Significantly in most of my " panic reaction " cases I have noted a general emotional immaturity and dependence on parental figures. The smooth cherubic baby-faces of some of these patients are very typical (in strong contrast to the adult appearance and manner of the anxiety states), and one can easily foresee their fearful panic and retreat in the face of new emotional demands. There are also present the same poor (or unstable) socialization, the same passivity and lack of initiative and brooding inferiorities, that one finds, if one looks for it, in the *pre*psychotic histories of schizophrenics. One cannot help thinking that in this panicky withdrawal, coupled with an unstable *internal* integration in a suitably predisposed introvert, one has the key to the schizophrenic disorders. At any rate it gives a working hypothesis which fits the facts, and one on which to base a rational psychotherapy of the " early " cases quoted in this paper. My aim is primarily to work up a positive transference which will hold the patient, and give enough support to tide him (or her) over the critically unstable adolescent years. Essentially one helps patients to resolve their immediate conflicts, so making possible new integrations that would normally be too difficult for them to assimilate.

The prognosis is as a rule quite hopeful, though of course one is bound to come across patients who do not respond. I remember one girl of 18 who was under my care for over two years. I kept her going for 12 months on simple psychotherapy of the above kind. But after many vicissitudes a pronounced divorce between thought and feeling blocked further psychological approach. A later relapse was treated by E.C.T. (11 applications) with great benefit ; it reduced the emotional force behind her delusory ideas so that she could and did ignore them, though they were still present. (I have not heard from her for over 12 months now.) Another one already quoted (Case 3) broke down and had to be admitted to mental hospital for insulin therapy.

This is my usual approach : psychological exploration first, and the more drastic physical methods if it fails. I know there are some psychiatrists who would advocate insulin therapy immediately upon diagnosis, on the principle that the early cases give the best results. I would hardly be disposed to agree, particularly in view of the vagaries and uncertainty of diagnosis I have tried to describe here. Some cases there are, dull, emotionally impoverished, inaccessible (the so-called slowly developing schizophrenia simplex), or, again, the more malignant types which cannot or will not co-operate, for whom it is the only course, but wherever possible I would suggest that some attempt be made at psychological exploration and readjustment.

Of course my material is derived largely from the early and milder private and " Child Guidance " cases ; yours, being bound up with the hospital patient, may be very different. The field is wide and much of it fairly new to psychiatry; one's personal experience is bound in the nature of things to be limited, and an exchange of views is very helpful. I have given you mine, and would be very pleased indeed to hear yours.

THE DEPERSONALIZATION SYNDROME: REPORT OF A CASE.

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Introduction.

This paper presents an example of the depersonalization syndrome as experienced and described by an intelligent patient. Considering the frequency of its occurrence, this syndrome has not been as often recognized nor as adequately described as would be expected. The syndrome was first described by Mayer-Gross (1935), later by Gordon (1936), Shorvon (1946, 1947) and Tayleur Stockings (1947). The psychopathology of depersonalization was given in analytical terms by Oberndorf (1935, 1936) and Feigenbaum (1937); Galdston has recently discussed this aspect (1947). As a symptom of organic brain disease, depersonalization offers an interesting field in the long-disputed question of body-mind relationship. Reidl (1942) described this symptom in a case of carbon monoxide poisoning, and Brock and Weisel (1942) discussed its occurrence in organic cerebral disease. Guttman and Maclay (1936) described the interesting relationship between mescaline intoxication and depersonalization. Cerebral anatomical localization was discussed in an anatomico-clinical study by Dide (1938).

The case described here is so classical an example of the syndrome that a record of the patient's symptoms in her own words was considered to be of value in aiding recognition of this peculiar condition. Depersonalization needs no introduction as a symptom of psychiatric disorder. It is found commonly enough in depressive states, hysteria, obsessional-ruminative neuroses, and sometimes in schizophrenia. However, in the condition about to be described, depersonalization is viewed as a distinct disease entity with a peculiar group of symptoms which together form a well-demarcated syndrome.

Symptomatology.

In his paper in this Journal,* Tayleur Stockings classified the symptoms of the syndrome under the following headings:

(1) Depersonalization.
(2) Derealization.
(3) Emotional poverty.
(4) Cephalic paraesthesiae.
(5) Thought disorder.

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* *J. Ment. Sci.*, 1947, **93**, 62.

By depersonalization is meant a feeling that one is no longer oneself—i.e. one no longer believes fully in one's own existence.† Derealization is the term applied to the feeling that one's environment is unreal, or has changed in quality. The affective disturbance is characteristically a poverty of emotional feeling towards objects that normally provoke an emotional response, e.g. one's own children. To the observer the patient appears to be quietly apathetic. Cephalic parasthesiae are the effect of depersonalization applied to the head. The head feels "numb, dead, empty, or solid." Thought disorder is characterized by difficulty and slowness in thinking, with marked impairment of mental imagery, e.g. the inability to recall a face or a melody.

Case History.

The patient, a housewife, aged 57, with no children, had had two previous nervous illnesses, the last of which was an agitated involutional depression at 43. Her present illness, however, differed considerably from the others. She was normally a cheerful, capable person until her illness commenced in January, 1948, with insomnia, which came on while she was in the throes of buying a house and furniture. This persisted until May, 1948, when she suddenly awoke in the middle of the night with the feeling that her body was numb and "cut off" from her surroundings. Next day her head seemed cloudy, and she described her surroundings as appearing unreal to her. She was admitted to hospital a few weeks later. The patient's symptoms are now described in her own words, and classified under the characteristic symptoms of the syndrome.

Depersonalization.—" I feel as though I'm not alive—as though my body is an empty, lifeless shell. I seem to be standing apart from the rest of the world, as though I'm not really here. Is there something wrong with my ears? I hear you clearly, yet your voice sounds far away—distant and unreal. Whatever has deadened my feelings has deadened my hearing too. It's the same with my eyes. I see but I don't feel. I taste but it means nothing to me. I'll eat anything put before me. We had walnut cake which I normally adore—but it might have been a piece of dry bread. I eat, not for pleasure, but only to live. Perfume doesn't smell pleasant any longer. I'd have no preference for the smell of these roses over the smell of the cabbage cooking."

Derealization.—" The wireless is playing, but there's no response in me. Music usually moves me, but now it might as well be someone mincing potatoes. I really love music, but now I can't bear it because it doesn't stir me. I hear it with my ears in a rather distant way, but there's no pleasure attached—it might be someone speaking rather than singing.

" It's the same with flowers. I should feel deep pleasure from these roses my husband sent me, but they mean nothing to me. I was an expert at arranging flowers, but not now. They all look drab to me no matter how they are placed. I can't admire a painting—it affords me no pleasure.

" I seem to be walking about in a world I recognize but don't feel. I saw Big Ben alight last night, normally a moving sight to me, but it might have been an alarm clock for all I felt. It all makes me feel so lonely and cut off. It's the terrible isolation from the rest of the world that frightens me. It's having no contact with people or my husband. I talk to them and see them, but I don't feel they are really there. When I close my eyes I no longer feel their presence."

Emotional shallowness.—" My husband and I have always been happy together, but now he sits here and might be a complete stranger. I know he is my husband only by his appearance—he might be anybody for all I feel towards him. That's what worries me most of all. How can my feelings for him have changed after all these years?

" I was always soft and feminine, but now I feel hard, as though nothing could shock me any longer. I'm beyond feeling. Meeting a friend I say the conventional things, but feel nothing and don't mean what I say.

" A comedian on the wireless I normally like immensely just doesn't amuse me now. I laugh politely with everyone else, but feel neither joy nor sorrow. I hear the birds singing in the morning, but my hearing of pleasant sounds is affected as badly as all my other feelings."

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† *Textbook of Psychiatry*, 1946, Henderson and Gillespie.

Cephalic parasthesiae.—" I call my head my pound of cocoa. It feels as though my skull is packed solid with sawdust—it's solid and heavy—it doesn't think any more. My head is very queer. It feels distinctly heavy on my neck, and it seems divorced from the rest of my body. I feel very conscious of my head."

Thought disorder.—" I can't argue with people because I can't collect my thoughts sufficiently. My thinking isn't clear and I forget the trend of a conversation. I don't think I'm able to concentrate accurately on one subject. I don't feel able to put over my ideas or to make people understand what I mean."

Discussion.

The suddenness of onset of the disorder in this case is a common feature of this illness. It will be noted that many of the symptoms are referred to the special senses of hearing and seeing—so much so that the patient saw an otologist and an oculist for imagined defects. Her special senses, in fact, were quite normal, but the lack of emotional response normally accompanying sensations gave the impression of disability in these organs. Awareness of the external world through hearing, seeing, touching, tasting and smelling is qualitatively distorted when the normal concomitant emotional response to these sensations is diminished. It is, in fact, the projection of one's emotional feelings out on to objects in the external world that gives these objects their quality of reality. One must look, not merely see ; listen, not merely hear ; feel, not merely touch ; savour, not merely taste ; sniff, not merely smell. Lack of projection of one's emotions produces an unreal world. And it is this phenomenon that underlies the depersonalization syndrome. It is a tentative withdrawal from reality.

Depersonalization as a symptom of other psychiatric disorders takes second place to the other gross symptoms, e.g. of hysteria or depression. In the true syndrome, however, the five prominent symptoms of depersonalization, derealization, emotional shallowness, cephalic parasthesiae and thought disorder are outstanding. Furthermore, the absence of hallucinations, delusions and ideas of reference is a prerequisite of the diagnosis. For it is the very absence of the process of projection that underlies depersonalization and derealization.

There is no evidence of intellectual deterioration. On the contrary, intelligence is usually above average, and insight is well maintained.

The syndrome is particularly to be differentiated from depressive states, which it may superficially resemble. Though the patient may on first examination appear to be mildly depressed, it is soon clear that lack of feeling rather than feeling of depression is the prevailing mood. Apathy rather than sorrow describes the patient's affective state. Slowness of thinking may be complained of, but this differs from the retardation of depression by being purely subjective. There is no objective evidence of retardation of thought, speech or movement. The agitated state frequently found in non-retarded depressions is not seen in the depersonalization syndrome. Similarly, delusions of unworthiness, poverty and disease are never found in the syndrome, though they are, of course, common in psychotic depressive states. Finally, insight is usually very limited if not completely absent in a depressive state severe enough to produce nihilistic delusions, whereas in the depersonalization syndrome insight is always well maintained. Nihilistic delusions and depersonalization are obviously closely allied symptoms. And it must be remembered that depersonalization is a not uncommon symptom of both mild and severe depressive states. However, the differentiation between the syndrome and depressive states is not very difficult when one considers the positive and negative features of both these disorders.

E.C.T. is the treatment of choice for this syndrome. The majority of cases appear to clear up completely, but often rather prolonged treatment is required, e.g. 15 E.C.T. sessions. Five cases followed up for a minimum period of one year have not had a relapse.

SUMMARY.

The depersonalization syndrome is described. A description of the symptomatology is given in a patient's own words. The psychopathology and diagnosis are discussed.

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SLOWING OF THE ALPHA-RHYTHM OF THE ELECTROENCEPHALOGRAM AND ITS ASSOCIATION WITH MENTAL DETERIORATION AND EPILEPSY.*

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Introduction.

There are few studies relating electroencephalographic characters with mental deterioration. Romano and Engel (1) (2) made an EEG and clinical study of "delirium" which they defined as the "toxic-infective state or psychosis associated with somatic disease" which was accompanied by "fluctuation in the level of awareness" and "intellectual, emotional and motor regressive behaviour"; the group included cases of chronic and acute cardiac decompensation, chronic alcoholism, hypertensive states, and severe Addison's disease. These authors considered that the EEG changes could be graded into three main groups, in order of severity: firstly, "decrease in frequency," with increase of slow 4–7 frequencies and normal blocking responses to visual attention; next, "disorganization," with irregular slow 2–7 frequencies and poor blocking responses; and finally, "reorganization at a lower energy level," with moderately high voltage slow 3–7 c./sec. activity, few or no normal frequencies, and absent blocking response to visual attention. This latter stage was, in some cases, found to be irreversible. Previously, Engel and Margolin (3) had published the results of an investigation into the effect of both oxygen and glucose-deprivation on the human electro-encephalogram. Both these conditions produced bursts of diffuse generalized 3–6 c./sec. activity which, in those cases with an acute onset, reverted to normal rhythms as clinical improvement occurred. However, 4 patients with chronic cerebral anoxaemia were examined (end-stages of chronic bronchitis with right-sided heart-failure) in whom the EEG abnormalities persisted; at an early stage, activity with a frequency of 5–6 c./sec. appeared, and still later the records became completely disorganized. There was one patient who ultimately recovered whose EEG showed a regular dominant alpha rhythm with a frequency of 7·5 to 8 c./sec. It had already been noticed that, in a few cases where the EEG had apparently returned to normal in prolonged anoxic and hypoglycaemic cases, there yet remained some degree of intellectual deficit on psychological testing. Hill (4) had observed that a type of EEG with a slower dominant alpha-rhythm than the normal 8–13 c./sec. (i.e. a rhythm at 6–8 c./sec.) was frequently associated with mental deterioration. An investigation was accordingly instituted to determine to what degree mental deterioration and slowing of the dominant rhythm in the post-central areas (alpha-rhythm) were associated.

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CLINICAL MATERIAL AND METHOD OF STUDY.

A preliminary study of 1,500 consecutive EEG's at the Maudsley Hospital and 1,000 at the National Hospital for Nervous Diseases, a total of 2,500 in all, was undertaken, and amongst these were found 20 cases with a slowing of the alpha-rhythm. Since the Maudsley Hospital is predominantly a psychiatric hospital and the National Hospital is predominantly neurological, it was to be expected that organic cerebral disease, and hence irreversible EEG changes, would be more commonly found in the clinical material at the latter hospital. This was indeed the case, since only 5 of the 20 were Maudsley cases, despite the fact that 50 per cent. more EEG's had been examined at that hospital. Of these 5 patients, 3 were epileptics, 1 showed a post-encephalitic syndrome, and 1 patient suffered from multiple tics and had an early history of " chorea." The clinical notes of the 20 cases with slow alpha-rhythm were reviewed to determine the presence or absence of a degree of mental deterioration detectable on ordinary routine clinical examination. Finally, the 1,000 cases already investigated at the National Hospital (less the 15 cases with slow alpha-rhythm) were further reviewed to find those which had demonstrated mental deterioration—in other words, patients who were so dull and deteriorated that they were found to be obviously so during an ordinary neurological examination. These numbered 15. This second group of cases was then studied to determine how far mental deterioration was associated with EEG abnormalities other than the picture already found with the slowing of the alpha-rhythm. For purposes of comparison these two groups have been separated into Group I (Tables I and II) and Group II (Tables IV and VI).

The EEG's of patients under 20 years of age were excluded, since it was less likely that constitutional immaturity of the EEG would be present above that age which would invalidate the findings. Age and sex were taken into consideration to determine any possible abnormal distribution in relation to these factors. Since many cases were found to be epileptic, the severity of the disorder, where present, was evaluated and a family history of epilepsy was sought. Trauma to the brain may produce mental deterioration and EEG changes, and consequently such an association was investigated ; finally, factors which of themselves might modify the EEG, such as organic nervous disease, cerebral arteriosclerosis and increased intracranial pressure, were sought.

In the EEG records the frequency, amplitude and extent of the dominant postcentral rhythm were observed, as well as the response to visual stimulation. Other rhythms, fast and slow, were tabulated together with their respective locations ; and finally, voluntary overbreathing for 3 minutes was done (so far as the mental condition would allow) to bring out any latent abnormality.

TABLE I.—*EEG Findings in Preliminary Group*

Case No.	Alpha-rhythm.			Area of alpha-rhythm.			Blocking.	Oth rhyth fas (c./
	Frequency. (c./s.)	Amplitude. (μv.)	Percentage.	Occipital.	Forward spread.	Including frontal.		
I	7–8	50	<50	+	+	—	Poor : variable	2
II	6–8	30–50	50	+	+	—	,, ,,	—
III	7–8	50	> 50	+	+	+	Fair : variable	—
IV	6–8	50	50–75	+	+	+	Poor	—
V	7–8	25	30–40	+	+	—	Nil	—
VI	6–8	40–60	50–75	+	+	+	Poor : variable	—
VII	7	50	50–75	+	+	+	Fair	—
VIII	6–7	50–60	50	+	+	+	Nil	2
IX	8	60	75	+	+	+	,,	16–
X	6–8	50	75	+	+	+	,,	—
XI	6–8	50–70	75	+	+	+	,,	16–
XII	6–8	50	50–75	+	+	+	Fair : variable	—
XIII	7–8	50	> 75	+	+	+	,, ,,	2
XIV	7–8	60	> 50	+	+	+	Poor : variable	—
XV	6–7	40–50	75	+	+	+	Nil	—
XVI	7–8	50	50	+	+	+	,,	16
XVII	5–7	60	50	+	+	+	,,	—
XVIII	7–8	50	<50	+	+	—	,,	—
XIX	7–8	50	50–75	+	+	+	,,	16–
XX	6–7	50	50–75	+	+	+	Poor : variable	—

ses, Presenting with Slowing of Alpha-rhythm.

Other hythms : slow.	Location of other rhythms.		Symmetry.	Response to over-breathing.	
	Fast.	Slow.		Stable.	Unstable.
–6 c./s., 50 µv.	Frontal	Frontal and diffuse	+	Not done	
–6 c./s., 0–50 µv.	—	Diffuse : Postcentral > precentral	Right > left	+	—
–6 c./s., 50 µv.	—	Diffuse : frontal +	Fair	—	Slight
–4 c./s., 50 µv.	—	Diffuse : temporal +	+	+	—
–6 c./s., 0–100 µv.	—	Diffuse : Right > left	Poor : Right > left	+	—
Rare : 3–6 c./s., 50 µv.	—	Diffuse	Fair	+	—
—	—	—	+	Not done	
ccasional, 3–4 c./s.	Fronto-parietal	Diffuse : frontal +	+	+	—
ccasional, 4 c./s.	Diffuse	Occipito-parietal	+	Not done	
3–4 c./s., pike and wave 100 µv.	—	Frontal : right > left, but bilaterally synchronous	Fair	"	
3–4 c./s., pike and wave 100 µv.	Diffuse frontal	Diffuse	+	"	
3–6 c./s., 0–70 µv.	—	Occipito-parietal : Left > right	Fair	—	+ (even after glucose)
ccasional, 3–6 c./s., 0–100 µv.	Frontal	Diffuse	"	—	+ (1 spike and wave)
2–6 c./s., 0–80 µv.	—	"	"	+	—
2–6 c./s., pike and wave 100 µv.	—	"	"	Not done	
3–6 c./s., 100 µv.	Frontal	Fronto-parietal	+	+, spike and wave complexes	—
2–4 c./s., 0–80 µv.	—	Diffuse	+	+	—
2–6 c./s., 100 µv.	—	"	Poor	+ (relatively)	—
ccasional, 3–6 c./s., one burst of 3 c./s., 100 µv.	Diffuse : more posteriorly	"	+	+	—
ccasional, 3–6 c./s., 0–60 µv.	—	"	+	+	—

TABLE II.—*Clinical Findings in Preliminary Group*

Case No.	Age.	Sex.	Fits.	Duration of symptoms.	Diagnosis.	Family history of epilepsy.	Head trauma.	General systemic disease.
I	66	F.	—	4 years	Presenile dementia	Positive	Nil	Nil
II	59	M.	+	8-9	Ditto	Negative	,,	(1) Old T.B. lungs (2) B.P.—180/105 (3) Rheumatism
III	41	M.	+	4 months	Cortical atrophy	,,	,,	Nil
IV	65	F.	+ (1 fit only at onset)	3 years	Cerebral arterio-sclerosis	,,	,,	(1) *Hypertension*—B.P. 170/95 (2) *Heart* — Aortic systolic (3) Retinal arterio-sclerosis
V	60	F.	+	3 ,,	Hypertensive encephalopathy	,,	Minor H.I. 1940: short period of unconsciousness	(1) *Hypertension*—B.P. 240/100 (2) *Heart*—enlarged to left. Aortic second sound increased
VI	44	F.	—	2 ,,	Cerebral syphilis	,,	Nil	Optic atrophy
VII	56	M.	—	44 ,,	Multiple tics	,,	Head injury aged 10 years	Nil
VIII	23	M.	—	5 ,,	Post-encephalitic syndrome	,,	Nil	,,
IX	44	M.	+	Indefinite	Epilepsy with hysteria	Negative	Head injury 1944	Nil
X	25	M.	+	23 years	Epilepsy	,,	Head injury preceded fits; fell on stone floor—unconscious	,,
XI	28	M.	+	19 ,,	,,	,,	Nil	,, B.P. 130/98
XII	21	M.	+	13 ,,	,,	,,	Head injury aged 6 years	Nil
XIII	43	M.	+	17 ,,	,,	,,	Nil	,,
XIV	25	F.	+	22 ,,	,,	,,	Fall on forehead preceded first attack	,,
XV	22	F.	+	15 ,,	,,	,,	Nil	,,
XVI	41	M.	+	25 ,,	,,	,,	,,	,,
XVII	25	F.	+	13 ,,	,,	,,	,,	,
XVIII	28	F.	+	11 ,,	,,	,,	,,	,
XIX	48	M.	+	8 ,,	,,	,,	,,	
XX	25	F	+	1 year	,,	,,	,,	,,

of Cases, Presenting with Slowing of Alpha-rhythm.

Mental deterioration.	Personality deterioration.	Neurological signs.	Raised intra-cranial pressure.	Special investigations.	Past illnesses.
Gross dementia (Shipley-Hartford)	Slowness and dullness	Nil	Absent	(1) *Pneumoencephalogram*—gross cortical atrophy (2) *X-ray skull*—N.A.D. (3) *X-ray chest*—N.A.D. (4) *C.S.F.*—normal	"Nervous breakdown" aged 46 years—lasted 6 months.
Gross dementia (simple testing including Babcock)	Slowness and dullness	Weakness and tremor of left side of body in fits	,,	(1) *X-ray chest*—old T.B. (2) *C.S.F.*—normal (3) *Pneumoencephalogram*—General dilatation of ventricles; enlargement of right parietal region	(1) Rheumatism aged 13 years. (2) Deafness right ear; long duration.
Gross dementia (simple testing including Babcock)	Nil gross	Slight left facial weakness	,,	(1) *C.S.F.*—normal (2) *X-ray skull*—N.A.D. (3) *Pneumoencephalogram*—more air in left than in right lateral ventricle. Suspicious shift of third ventricle to left (4) *Operation* — cortical atrophy only (5) *Fundi*—colloid body formations	Neurasthenia age 27 years: tendency to drop things, tiredness—lasted one month, nil since.
Moderate	Slowness	(1) Dysarthria (2) Left facial weakness (3) Hearing — bilaterally affected (4) Left pyramidal lesion. Left paresis and tremor (5) Conjugate movement of eyes to right impaired	,,	(1) *X-ray skull*—N.A.D. (2) *X-ray chest*—N.A.D.	Hypertension 3 years.
Difficult to estimate owing to deafness	Dull and slow	Nil	,,	(1) *X-ray skull*—N.A.D. (2) *Deafness*	(1) Neurasthenia 1919. (2) Bilateral mastoids.
Memory poor: orientation poor	Dullness	(1) Optic atrophy (2) Right anosmia (3) Numbness left	,,	(1) *C.S.F.* (Lange)—mild. Continuous. No comas (2) *Blood W.R.*—positive	Nil relevant.
Slight	Nil gross	Nil	,,	(1) *I.Q.*—low average (2) *Blood W.R.*—negative (3) *E.S.R.*—normal	Chorea aged 12 years.
Retardation mental and motor	Withdrawn obsessive thinking	,,	,,	(1) *Blood W.R.*—negative (2) *E.S.R.*—normal (3) *C.S.F.*—normal	Illness started as "nervous trouble."
Moderate	Psychopathic personality	(1) Slurred speech (2) Tremors (3) Minor fits	Absent	*I.Q.*—low average	? Encephalitis 1941.
Slight	Nil gross	(1) Right facial paresis: In fit head goes to right and right side of mouth is drawn up	,,	Nil	Nil relevant.
,,	,,	Nil	,,	(1) *X-ray skull*—N.A.D.	Recent psychomotor attacks.
Memory only fair: mental deterioration	Slowness	,,	,,	(1) *I.Q.*—below average (2) *C.S.F.*—normal (3) *X-ray skull*—slight oxycephaly. Suggestion of early cerebral atrophy	Nil relevant.
Mental slowness	Dull	,,	,,	Nil	,,
Very backward	Dull and mentally slow	Fits show activity on left side of body	,,	(1) *Blood W.R.*—negative (2) *X-ray skull*—strong suggestion of venous angioma left frontal and fronto-temporal areas	,,
Mental slowness	Dull	Nil	,,	*X-ray skull*—N.A.D.	Convulsions at age of 7 months.
Very poor memory and concentration	Irritable	,,	,,	*Psychological testing* shows organic deterioration	Nil relevant.
Poor concentration, 1944, but reported bright 29.ix.45	Moody and difficult 1944. Episodic changes	(1) No abnormal physical signs (2) Fits start left leg; consciousness lost as sensory phenomena reach up to knee	,,	(1) *X-ray skull*—N.A.D. (2) *C.S.F.*—normal	,,
Memory and concentration poor	Recent deterioration—dull and slow	Nil	,,	Nil	,,
Nil gross: Earning £650 per annum as commercial artist	Nil gross	,,	,,	*Blood W.R.*—negative	*Backache* November, 1943, and March, 1944.
Memory fair	Dull with temper outbursts	,,	,,	(1) *X-ray skull*—N.A.D. (2) *Blood W.R.*—negative	Nil relevant.

A 3-channel Grass apparatus was used for recording, with standard bipolar electrode-placements in antero-posterior and transverse positions ; the duration of the recording was 25–30 minutes. The blood-sugar level at the time of testing was not estimated, but subjects were examined after fasting for more than 4 hours in most cases.

RESULTS.

Group I.

This was the group that was chosen primarily because of slowing of the alpha-rhythm.

EEG findings.—20 EEG's with a slowing of the dominant alpha rhythm were discovered in the 2,500 cases examined at both hospitals ; the results of analysis are summarized in Table I.

The dominant alpha-rhythm was in the 6–8 c./sec. range in all cases except in one in which it was 5–7 c./sec. ; the amplitude was mainly in the range of 50–60 μv., only 3 being below this ; the per cent-time alpha was characteristically 50–75 per cent. Forward spread of the alpha-rhythm occurred in all cases, and failed to reach the frontal region in only 4 cases. The response to visual stimulation was characteristically absent or defective ; half the cases did not respond at all and, of the other 10, 8 gave a variable response, in that blocking in some part of the records was better than in others, with a general tendency for the response to be poor earlier and better later in the recording. Fast rhythms in the 16–22 c./sec. range were present in 7 cases, mainly in the frontal areas, and slow rhythms with a frequency of 2–7 c./sec. were present in all cases except one. The slow rhythms showed a tendency to appear in bursts, were of high voltage in 15 of the 20 EEG's, and in 2, characteristic spike-and-wave discharges occurred ; moreover, the slow activity was diffuse in all areas, with maximal location in the frontal regions, except in 2 cases where the main site of appearance was in the occipito-parietal areas. Symmetry of frequency and amplitude was good in 10 cases, fair in 7, and poor in only 3. Hyperventilation could only be performed in 14 of the 20 cases, and of these, 11 were stable ; one epileptic produced a spike-and-wave response after a previously stable record. A tendency was noted for bursts of activity to appear, during which the fast rhythms doubled and then halved in frequency. The slow waves also often appeared in bursts with, frequently, fast waves superimposed upon them.

To summarize, a fairly characteristic EEG picture within this group can therefore be described associated with the slowing of the dominant alpha rhythm. It presents the following features :

A dominant occipital rhythm of 6–8 c./sec., having an amplitude of 50–60 μv., being present 50-75 per cent. of the time and spreading forward to the frontal regions, but showing poor response to visual stimulation. Slow rhythms are mainly located in the frontal areas, which show fair to good symmetry.

Clinical findings.—The clinical data in this group are summarized in Table II. The diagnoses show a preponderance of epileptic cases (Table III).

TABLE III.—*Diagnostic Classification of Cases in Group I.*

Epilepsy	12 cases.
Arteriosclerotic dementia	3 ,,
Postencephalitic syndrome	1 case.
Cerebral syphilis	1 ,,
Presenile dementia	1 ,,
Cortical atrophy	1 ,,
Multiple tics	1 ,,
Total	20 cases.

Cerebral dysfunction, in the form of idiopathic epilepsy or organic cerebral disease, was present in all the cases with slowing of the alpha-rhythm. Examination of out-patient and in-patient clinical records revealed mental deterioration of such a degree as to be obvious to ordinary clinical examination and simple psychological testing (memory-testing, serial sevens test and general knowledge) in all cases except one, who was holding down a job as a commercial artist. Unfortunately the patient could not be followed up and his intelligence could not be tested. One case of epilepsy presented as being dull on one occasion and brighter on a subsequent visit; again this patient was not subjected to psychological testing. The clinical records showed that one can certainly associate mental deterioration in this group with slowing of the alpha-rhythm; though the association is not an absolute one, it was present in at least 18 of the 20 cases. Of equal significance is the finding that fits were present in 16 of the 20 cases; 4 of these were organic cerebral states, but in all of them fits were infrequent, in contradistinction to the idiopathic epileptic group. Personality changes were marked in 13 of the 20 patients and consisted mainly of dullness and withdrawal, but 5 of the 13 showed in addition the excessive emotional instability of the patient with organic cerebral disorder. Clinical signs of impaired function in the central nervous system were definitely present in 8 of the 20 cases, in 3 supported by pneumoencephalographic studies. A family history of epilepsy was obtained in only one case. Head-trauma was a negligible factor. The duration of illness was variable, though all the epileptic cases were of long standing except one; the onset of dullness was generally a gradual one. Sex of the patient was not a factor in aetiology, and a study of age revealed nothing significant except that epilepsy occurred in the lower age-groups.

Group II.

This group of 15 cases, selected primarily because of the presence of mental deterioration, was found in the 985 cases remaining at the National Hospital after the 15 with slow alpha-rhythm had been examined.

EEG findings.—These are summarized in Table VI. The same factors as in Group I were investigated, but no characteristic EEG's were found, although 11 of the cases showed some abnormality. The dominant frequencies in the post-central areas were within the normal range of alpha rhythm in all cases

TABLE IV.—*Clinical Findings in Second Grou*

Case No.	Age.	Sex.	Fits.	Duration of symptoms.	Diagnosis.	Family history of epilepsy.	Head trauma.	General systemic disease.
I	59	M.	—	5 years	Alcoholic dementia	Negative	Nil	Nil
II	61	M.	—	1½ "	Hypertensive encephalopathy	"	"	(1) *Heart*—hypertensiv (2) *B.P.*—240/135
III	31	F.	—	15 "	Post-encephalitic Parkinsonism	"	"	Nil
IV	60	M.	+	15 "	Hypertensive encephalopathy	"	"	(1) *B.P.*—210/120 (2) *Heart*—hypertensiv (3) *Fundi*—arterio-scle (4) Recent confusional sode
V	75	M.	—	1 year	Cerebral arterio-sclerosis	"	"	(1) *B.P.*—130/90 (2) *Cataracts*
VI	48	M.	—	3 years	Presenile dementia	"	"	(1) *B.P.*—120/80
VII	61	M.	+	2 "	Cortical atrophy	"	"	Nil
VIII	46	F.	+	2 "	" "	"	"	"
IX	52	M.	+	6 "	Presenile dementia	"	"	(1) General arterio-scle (2) *B.P.*—140/80
X	53	M.	+	23 "	Epilepsy with mental deterioration	"	"	(1) *Fundi*—arterio-scle (2) *B.P.*—160/95
XI	44	M.	—	7 "	Post-encephalitic Parkinsonism	"	"	Nil
XII	49	M.	+	6 "	Epilepsy with mental deterioration	"	"	"
XIII	60	F.	+	2 "	Cortical atrophy	"	"	"
XIV	62	F.	+	18 months	" "	"	"	(1) *Cardio-vascular* s —normal (2) *B.P.*—140/90
XV	56	F.	+	2 years	Presenile dementia	"	"	(1) *Cardio-vascular* s —normal (2) *B.P.*—120/80

Cases Presenting Primarily with Mental Deterioration.

Mental deterioration.	Personality deterioration.	Neurological signs.	Raised intra-cranial pressure.	Special investigations.	Past illnesses.
Dementia	Apathetic	Nil	+ (?)	(1) *X-ray skull*—? suggestive of increased intra-cranial pressure (2) *C.S.F.*—normal	Nil relevant.
Dullness and memory failure	Depression	(1) Early pseudo-bulbar palsy (2) Spasticity right arm	Absent	(1) *X-ray skull*—bilateral mild hyperostosis frontalis interna (2) Encephalography — moderate general dilatation of ventricles—general cerebral atrophy	,,
Dullness, slowness and poor memory—5 years	Depressive attacks	(1) Tremor right arm (2) Increased salivation (3) Oculogyric crises (4) Cogwheel rigidity	,,	Nil	Encephalitis 15 years ago.
Memory and judgment poor (improving)	Confused	Speech difficulty	,,	(1) *C.S.F.*—normal (2) *Kidney function*—good (3) *Blood urea*—35 mgm. % (4) *X-ray skull*—N.A.D.	Nil relevant.
Dementia	Apathetic	Slight left hemiparesis	,,	(1) *C.S.F.*—normal (2) *Fundi*—arterio-sclerotic	,,
,,	Facile and euphoric	(1) Ataxia (2) Diplopia (3) Coarse nystagmus (4) Plantars extensor	,,	(1) *C.S.F.*—normal (2) *Encephalography*—dilatation of all ventricles with cortical atrophy ++ in frontal region	,,
Memory failure	Emotional instability	Weakness right arm, right lower face, and right side tongue	,,	(1) *C.S.F.*—normal (2) *Ventriculography*—enlarged right lateral ventricle with slight displacement of ventricles to right; suggests atrophic process right hemisphere	,,
Poor memory	Dullness	(1) Difficulty in swallowing (2) Right leg slightly weak after fits (3) Nominal aphasia	,,	(1) *C.S.F.*—normal (2) *Encephalography*—slight dilatation of left ventricular system as a whole. Abnormal amount of air over cortex	,,
,,	Dullness and apathy	(1) Slight tremor: left, right (2) Right pupil: left (3) Slight right facial weakness	,,	(1) *X-ray skull*—N.A.D. (2) *C.S.F.*—normal	,,
Dementia (recent)	Ditto	(1) Early bilateral grasp reflexes (2) ? Left extensor response (3) Tremors of legs	,,	(1) *C.S.F.*—normal (2) *Blood count*—normal (3) *X-ray skull*—normal	,,
Gross memory impairment and orientation poor	Dull and seclusive	(1) Choreo-athetotic movements (2) Cogwheel rigidity	,,	*Blood W.R.*—negative	Started with infective illness (some weeks).
Poor memory	Dullness	Nil	,,	,, ,,	Nil relevant.
Gross dementia	,,	,,	,,	,, ,,	,,
,,	,,	(1) Tremor of hands (2) ? Left extensor response	,,	,, ,,	,,
	,,	Nil	,,	,, ,,	,,

except 3, in which no dominant frequency at all could be found; one case showed a picture not unlike the Group I EEG, but at a steady frequency of 8 c./sec. Forward spread of alpha-rhythm and response to visual stimulation were less definite than in Group I and per cent-time alpha was low, an observation which was consistent with the presence of slow 2–7 c./sec. rhythms in as many as 12 of the 15 cases, these rhythms being generalized and with maximal incidence in the frontal regions. There was no marked difference between Groups I and II in relation to fast rhythms, symmetry, or response to hyperventilation.

Clinical findings.—The clinical data in this group are summarized in Table IV, and diagnostic classification is presented in Table V.

TABLE V.—*Diagnostic Classification of Cases in Group II.*

Cortical atrophy	4 cases.
Presenile dementia	3 ,,
Post-encephalitic syndrome	2 ,,
Hypertensive encephalopathy	2 ,,
Epileptic dementia	2 ,,
Cerebral arteriosclerosis	1 case.
Alcoholic dementia	1 ,,
Total	15 cases.

Epileptic fits occurred in 9 patients, but in only 2 were these more than incidental to a progressive organic state, in contradistinction to Group I,

TABLE VI.—*EEG Findings in Second Group*

Case No.	Alpha-rhythm.			Area of Alpha-rhythm.			Blocking.	Oth rhyth fas (c./
	Frequency. (c./s.)	Amplitude. (μv.)	Percentage.	Occipital.	Forward spread.	Including frontal.		
I	No dominant rhythm	50	—	—	—	—	?	—
II	10–11	30	25–50	+	+	Slight	Fair	Few
III	9–10	30	50–75	+	+	+	Poor	—
IV	8–10	40	25–50	+	+	Slight	+	—
V	7–10	50	50+	+	+	+	?	—
VI	8–10	40	50–75	+	+	+	Fair	—
VII	8–9	40	50	+	+	+	+	1
VIII	No dominant rhytnm	Very low	—	—	—	—	—	22 1
IX	9–10	50	50	+	+	—	+	—
X	9–10	50	50–75	+	+	+	+	—
XI	No dominant rhythm	20	—	—	—	—		—
XII	8–9	40	50–75	+	+	+	+	—
XIII	8	50	50	+	+	+	Fair	—
XIV	9–11	40	<50	+	+	Slight	Poor	—
XV	10–12	50	25–50	+	+	,,	Fair	2

where 12 of 15 cases with fits were idiopathic epileptics. Personality changes of organic type were present in all (viz. variable apathy, depression, confusion, euphoria and emotional instability). Abnormal signs in the central nervous system were demonstrable in 11 of the 15 patients. The four without such signs were the patient with alcoholic dementia, one of the two patients with epileptic dementia, a patient with cortical atrophy, and one with presenile dementia. Increased intracranial pressure was not found or suspected in any of the patients. Although 10 of the 15 patients were males, the series is too small for this to be of any significance. The time-interval between the onset of the illness and the appearance of mental deterioration could not be assessed; 7 of the histories were of under 2 years' duration. None of the patients gave a family history of epilepsy, nor was there any association with head injury. The relationships between slowing of the alpha frequency, mental deterioration and epilepsy are shown in Table VII.

TABLE VII.

	Mental deterioration.	Epilepsy.	Mental deterioration + epilepsy	No mental deterioration; no epilepsy
Slow alpha	3	2	14	1
Normal alpha	6	0	9	0

DISCUSSION.

Of the 35 cases of cerebral dysfunction examined mental deterioration was present in 33, and 18 of these showed a slow dominant alpha-rhythm which was associated to a marked degree with established epilepsy. Gibbs and

ses, Presenting Primarily with Mental Deterioration.

Other rhythms: slow. (c./s.)	Location of other rhythms.		Symmetry.	Response to over-breathing.	
	Fast.	Slow.		Stable.	Unstable.
2–6	—	Generalized	Fair	Not done	
—	Generalized	—	+	+	—
3–5	—	+ Fronto-parietal	+	Not done	
1–5	—	Generalized (++ right temporal)	Right> left	,,	
3–6	—	Generalized	Fair	,,	
—	—	—	+	+	—
ccasional, 4	Frontal +	Generalized	Fair	+	—
½–3	Generalized	++ Fronto-temporal	+	+	—
ow amplitude, 4–6	—	Frontal	+	—	+
Few, 4–7	—	,,	+	+	—
Few. 4–6	—	Generalized	+	Not done	
—	—	—	+	+	—
4–6	—	Generalized	+	+	—
2–5	—	Frontal mainly	Fair	—	Moderate
5–7	Generalized parietal +	Generalized	,,	—	+

Gibbs (5) state that deteriorated epileptics often show predominantly slow waves in the electroencephalogram—an observation which is supported by the present study ; slow wave activity was present in the frontal regions in many cases, though it was by no means confined to deteriorated epileptics. Putnam (6) points out that one must guard against misinterpreting the mental dullness, which is really an epileptic equivalent and is an expression of a continuous stretch of cerebral dysrhythmia ; but since the cases in this study have been followed up for prolonged periods, this renders such a misinterpretation unlikely. In a comparative study of the value of psychological abstraction tests and EEG in cases of brain damage, Greenblatt *et al.* (7) found that the only group where the EEG was more valuable diagnostically was in those cases where epilepsy was present. Any attempt to explain the phenomenon of the slow alpha-rhythm physiologically would be highly speculative ; no special evidence could be obtained pointing to a " reorganization at a lower energy-level " consequent upon a destruction of cortical neurones. What has emerged from the study is that mental deterioration is not specifically associated with slowing of the dominant alpha-rhythm but, when the latter is present, mental deterioration is probable and, moreover, particularly so when the patient has suffered from fits. The important practical application of this is that when one encounters this phenomenon in the EEG of an epileptic one should consider the probability of mental deterioration.

Summary.

In an examination of 2,500 consecutive EEG's 20 were found with slowing of the dominant alpha-rhythm to 6–8 c./sec., and of these 18 had definite mental deterioration.

Further investigation showed that mental deterioration is often associated with EEG abnormality, though not specifically with slowing of the alpha-rhythm.

There is a marked association between slowing of the alpha-rhythm and deterioration in epilepsy.

I am indebted to Dr. J. Purdon Martin and Dr. Denis Hill for access to material, and to the latter for his constant help and encouragement.

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Part II.—Reviews.

Epilepsies—Leurs Formes Cliniques: Leurs Traitements. By L. Marchand and J. de Ajuriaguerra. Paris: Desclee de Brouwer et Cie, 1948. 721 pp., including index. Price 475 francs.

It is the aim of the Bibliothèque Neuro-Psychiatrique de Langue Française to publish new works which will show that the vitality of neurology and psychiatry in Belgium, France and Switzerland has not been impaired by the interruption of the second world war. This aim is fulfilled by the present volume. Dr. Marchand has been writing prolifically on epilepsy since the turn of the century, and the book reflects a lifetime of clinical observation and intensive study of the European literature for the past 50 years. The development of our present-day knowledge of epilepsy, in its clinical and pathological aspects, is traced in detail, and all relevant contributions are critically discussed and assessed. Every physician concerned with epilepsy will read the book with benefit, and as a work of reference it will rarely fail him. The style is lucid and readable, and the closely-reasoned discussions are based on actual clinical observation of the patient. The book is divided into six sections, with numerous subsections, each of which is followed by a list of references which are mainly to the European literature, although North American sources are not entirely neglected.

In their introduction the authors contend that none of the present definitions of epilepsy is adequate even when added to them are such descriptive adjectives as idiopathic, essential, cryptogenic, genuine, infantile or symptomatic. They assert that there is not an epileptic disease, but that there are epileptic syndromes—the epilepsies. The varied clinical manifestations derive from varied pathogenic and aetiological causes. The so-called idiopathic or essential epilepsies are simply those in which the causal brain lesion has not been diagnosed during the lifetime of the patient. The convulsive reaction of the brain should be regarded as a biological property which is common to every individual; although the most obvious sign of epilepsy, it is by no means the most characteristic manifestation. Experience shows that there is an enormous number of variants in the clinical picture, so that it may be said that no two epileptics show the same type of seizure. It is from these considerations that the authors have undertaken to demonstrate the polymorphism of clinical epilepsy, and it is with validity that they claim to have reduced to a minimum any considerations based on theories of pathogenesis.

The first section of the book describes in great detail the clinical features of the convulsive seizure. Full accounts are given of the various prodromata, auras and post-convulsive phenomena. The descriptions are always illustrated by actual clinical cases, whose histories are often supplied. The next section describes the varied disorders of consciousness that occur in epilepsy, and psychiatrists will have particular interest in the accounts of automatic behaviour and the discussions of the forensic aspects of acts committed during the post-convulsive phase. It is in the clinical traditions of French psychiatry that a lengthy examination is made of the relation between periodic epileptic psychoses and other periodic psychoses, such as manic-depressive insanity. Although the discussion is nowadays perhaps somewhat academic and out-of-date, it is a tribute to careful clinical observation. There is a helpful account of the diagnostic features of epileptic psychoses, such as the suddenness of onset and disappearance of the psychotic features, their brevity, the concomitant presence of mental confusion, which may often be complicated by violent motor agitation, the association of automatism and the frequent occurrence of subsequent amnesia. Again, the relation of the convulsive seizure to disordered mental function is shown in several ways ; the psychiatric phenomena may succeed one or more seizures or absences, delirious attacks may culminate in a seizure, seizures may occur in the midst of an emotional outburst, the epileptic syndrome may for a time manifest itself solely by intermittent psychic seizures and convulsions may for long be absent, or the epileptic syndrome may present solely periodic psychic seizures.

The only fault that can be found in the book is that modern advances in diagnosis are sketchily described, so that the third section disposes of electro-encephalography in ten pages. The fourth and longest section exhaustively describes the special forms of epilepsy : sub-cortical, migrainous, psychasthenic, reflex, myoclonic and Bravais-Jacksonian (*anglice* Jacksonian) epilepsy, pyknolepsy, narcolepsy and cataplexy. Attacks of laughing and weeping, disorders of the body-image, and syndromes of morbid hunger and thirst are discussed at length in their association with epilepsy. The lucidly-argued examinations of the relations between epilepsy on the one hand and cataplexy, narcolepsy and migraine on the other hand are particularly valuable.

The fifth section deals with the clinical aspects of epilepsy at various periods of life. The relation of infantile convulsions to the epileptic syndrome is authoritatively presented. Prognostic considerations in infantile convulsions are usefully tabulated, and the section ends with an account of the variations that ageing produces in epilepsy. The penultimate section is devoted to the course of epilepsy, whether it be regressive, progressive or culminating in dementia. Under the first of these headings are described the effects of various intercurrent illnesses, such as pneumonia, tuberculosis, asthma, kidney disease, diabetes and so on. The authors point out that dementia may have two different types of pathogenesis ; most commonly dementia and epilepsy are two clinical manifestations of the one cerebral lesion. Secondly, dementia may be the result of cerebral changes consequent on the epileptic seizure : this is true epileptic dementia. It is pointed out that in the past, workers have failed to make this distinction, and so have expressed surprise when dementia appears without much relation to the occurrence of seizures.

The last section is concerned with the treatment of epilepsy, and maintains the erudition and completeness which characterize the whole volume. The authors' own treatment is orthodox and familiar, although for those patients who do not respond to the usual anticonvulsants it is suggested that pneumoencephalography should be performed, and that the injections of air, either by lumbar or intraventricular puncture,should be repeated frequently according to the results produced. It is claimed that the method is without danger ; the seizures often lessen in frequency or may disappear for several weeks or months, and the best results are found in those patients who previously had raised cerebrospinal fluid pressure. Such a recent anticonvulsant as Tridione is mentioned only briefly, and the discussions of modern surgical treatments are not up to date. English physicians have latterly adopted a rather less restrictive régime for their patients than is recommended by the authors, but the psychotherapeutic and social aspects of treatment have not been neglected.

HUNTER GILLIES.

Modern Practice in Psychological Medicine. Edited by J. R. Rees, M.D. London : Butterworth & Co. Ltd., 1949. Pp. xii + 475. Price 50s.

This book is a companion volume to *Modern Trends in Psychological Medicine*, edited by Dr. Noel Harris in 1948. Its approach is wider than that of the previous publication, but in many respects the same ground is covered, and the question arises why two large books should be utilized where one would do.

In this volume we have a group of twenty-nine contributors, and the result is rather a mixed bag. Some of the chapters are distinctly provocative, but the majority are content with giving more or less formal accounts which may be generally acceptable. As in all such books, there is a considerable overlap, which detracts from its value and makes it a little irritating. While books of this type may be useful as works of ready reference, yet they lack the co-ordination obtained by more modest publications. Brock Chisholm, Director-General, World Health Organization, in the initial chapter entitled " Health " gives a wide survey of the topic, especially in terms of a world problem. He emphasizes the place which psychiatry may come to occupy, stresses its preventive aspects, and obviously hopes that through psychiatry we may be enabled to solve a great many of the world's conflicts. He develops the idea by emphasizing the training of the child, and sees the solution of the world's problems in the nursery. There must be no frivolity or romance about this—such things as superstition, fairies and Santa Claus should be discarded ; that was the way of foolishness, but now we must have a world where reason and logic hold sway. It is contended that it is only by the realistic training of children that international trouble and war will disappear. To the reviewer, Chisholm's approach is over-enthusiastic and unrealistic, and it is doubtful—to say the best of it—whether this sort of pleading does any good for psychiatry. Here is an example of the argument used : " For instance, given universal mental and social health, such curses as tuberculosis, malaria, smallpox, diphtheria, typhus, venereal diseases, malnutrition and all its results and many others could be eradicated in a very short time." It is believed that a co-ordinated attack on diseases and " more efficient agriculture could change the ugly past and anxious present of the world to a future of progress and hope." It all sounds so easy and so naïve, and is so far removed from the actual difficulties of psychiatric work as to convey a totally erroneous impression of how psychiatry may help in the resettlement of a sick world. I trust that the majority of psychiatrists are more modest in their claims, and that they will avoid prescribing panaceas for the conduct of world affairs. We have still plenty to do in our mental hospitals, in our clinics, and in our every-day practice without becoming embroiled in world politics.

The other chapters are much less controversial than Chisholm's. For instance, R. G. Gordon writes in his usual pleasant, lucid way on the make-up of the Normal Individual. His outlook is based largely on McDougall's *Social Psychology*, which is a good and sure guide for anyone. In addition he gives a good description of the normal personality types as formulated by Jung. Geoffrey Thompson, in discussing Abnormal Psychology in relation to Emotional Development, admits that our theories are still tentative, and apologizes for any apparent dogmatism contained in his article. Thompson, however, seems to have no doubt that our infantile beliefs, impulses and fears are the root of all our subsequent troubles, and that they are the principal things to tackle if we are ever to be able to lead satisfactory lives. The manner, for instance, in which we deal with our emotional, sexual and phantasy life during the Oedipal period of our development " has a dominating influence in determining the pattern which sexual life will follow in later years." Such teaching is pretty stiff going for students and general practitioners, for whom this book is intended.

Bennet's chapter, entitled "The Diagnostic Interview," is disappointing. The discussion is a mixture of case-taking and a description of the psychoneuroses, with short and completely inadequate paragraphs dealing with the psychoses and mental deficiency. One would like to have seen this matter dealt with much more comprehensively, and have had more fully and clearly pointed out the inter-relationships between the various groupings, and the frequency with which combinations occur. Surely the purpose of the diagnostic interview is not merely to label a patient, but to form some estimate of prognosis and treatment, and the author might well have enlarged his views along those lines rather than by giving a somewhat formal clinical description of the anxiety state, psychosomatic illness, hysteria and obsessions.

Most of the authors have been greatly influenced by the psycho-analytic school, and this is brought out by Sutherland in his discussion of "Types of Personality." After giving the familiar descriptions associated with the names of Kretschmer, Jung, Sheldon and Pavlov, he expresses the opinion that the psychoanalysts have supplied a much more meaningful approach, "for their types are explained by the history of the person, and, further, the label tells us what forces are operating inside that person so that we can understand him." I wonder whether all that is really so. If it is so then we should be able to do much more for suffering humanity than we have accomplished so far. But surely it is not so easy as all that. The author seems to rely far too much on the opinions expressed by others rather than on his own clinical experience.

Wittkower's article on Psychosomatic Medicine has the great distinction of defining his topic in the following manner: Psychosomatic Medicine embraces (1) disorders—be they functional or organic—in the aetiology of which psychological factors are directly relevant in combination with other causes: for example, nervous dyspepsia and peptic ulcer; (2) disorders in which psychological factors indirectly play a predisposing and precipitating rôle, e.g. venereal disease; (3) disabilities, in the aetiology of which psychological factors play no part, but which are associated with emotional disturbance, e.g. war disablement. There is much in this article which is worthy of praise, but far too much emphasis and importance is attached to the delineation of types. For instance, the patient with migraine is ambitious, meticulous and exacting; a hay-fever patient is shut in and hypersensitive (I have known many who are not); the inoffensive, accommodating, convivial behaviour of the hypertensive patient "serves to camouflage strong hostile impulses and anxiety. Their need to make themselves well liked, coupled with potency doubts, accounts for their preference for wine, women and song." The above uncritical theorizing does not do credit to British psychiatry, and is out of place in a book designed for students and general practitioners.

The best article in the book, without making any invidious distinction, is by Main, who discusses "Industrial Stress and Psychiatric Illness." Main deals with the facts, he provides us with case-records, and he analyses the situation in which the disturbance is occurring. He appreciates that job placement is no panacea, and is successful only when it is used wisely. He points out that job-dissatisfaction is as often a symptom as the cause of the upset, and that no amount of environmental change will do any good unless backed and accompanied by psychiatric treatment. His observation in relation to the importance of minor intellectual defect in producing industrial misfits is something which should be much more clearly realized, because the amount of emotional instability among those intellectually involved is very serious. The social significance of this unstable dullard group is emphasized.

This book, then, may be regarded as a comprehensive survey of psychological medicine, but it is essentially a book of reference for those with experience and not a satisfactory guide for students and general practitioners.

D. K. Henderson.

Mental Readjustment. By Sidonie Reiss. London: Allen & Unwin, 1949. Price 10*s*. 6*d*.

This short (167 pp.) book is written by a disciple of Adler, who sees in Individual Psychology a solution for many of the world's problems of to-day. The first 65 pages are an excellent résumé of Adler's main concepts. The rest is a descriptive account of some seven cases. These are carefully selected, the patients are clearly described, several dreams are usually included, and the notes worked up into integrated portraits of individuals. The translator, Bernard Miall, has produced a most readable book.

No attempt is made to go beyond Individual Psychology, or to compare it with other schools of Psychotherapy. The book will not add to the knowledge of any well-read psychiatrist, but can be confidently recommended to any teacher, parent or welfare worker who wishes to understand the main tenets of Adler's Individual Psychology. R. F. Barbour.

The Mental Life of the Child. By Gustav Hans Graber, Dr. Phil. (Berne). London: Staples Press, 1949. Price 8*s*. 6*d*.

This small book, judging by the references, would appear to be a popular summary of the author's *Einheit und Zwiespalt der Seele.*

It falls into two parts. The first, some views upon a variety of theoretical points, including the mental life of the infant, aims of education, treatments.

The second half, entitled "Extracts from the Practice of Deep Psychological Analysis in Childhood," is a selection of notes from the cases of some 14 children.

The title of the book is somewhat misleading. It is in no sense a textbook, cannot be considered scientific, and deals only with the "psychoanalytical" (Freudian) life of the child. In the introduction the author states, "For the sake of simplicity, I have left out all changes in the environment, home, school, etc., which were necessary for the healing and mental hygiene of the child."

The case notes are not given in any scientific form, and appear more to be chosen to illustrate various Freudian concepts. No details regarding length of treatment for instance are given, although in one case 80 sessions are mentioned. It is clearly written, and may quite well stimulate parents, teachers, students, for whom it is designed, to read further. R. F. Barbour.

Twentieth Century Speech and Voice Correction. Edited by Emil Froeschels, M.D. (Philosophical Library, New York, 1948.)

This book comprises the whole field of speech pathology and therapy, including the disturbances of hearing related to anomalies of speech. Its 22 chapters are written by 18 authors, almost all American, and edited by the leading exponent of speech therapy Emil Froeschels, formerly of Vienna. He contributed the introductory chapter on Anatomy and Physiology, which makes difficult reading, possibly owing to a too literal translation from the original German; in contrast, his second contribution is a fluently-written and masterly section on the Pathology and Therapy of Stuttering, concise, constructive and practical. One would expect some inequalities in a book written by so many authors; but the general standard of exposition is high, with full consideration of the literature on each subject and a list of references after each section. Not only aphasia, alalia, dysarthria and paragrammatism in children are adequately dealt with, but one also finds chapters on the education of the deaf child, acoustic training of children and adults, remedial reading, prosthetic training of cleft palate, voice training after laryngectomy, etc. The general attitude of most writers is practical, which is a great advantage in a field where so much of the theoretical basis is controversial.

W. Mayer-Gross.

Atlas of Neuropathology. By Wm. Blackwood, M.B., F.R.C.S.E., T. C. Dodds, F.I.M.L.T., F.I.B.T., and J. C. Sommerville, A.I.M.L.T. Edinburgh: E. & S. Livingstone, Ltd. Cr. 4to. 212 pp. 262 illus. Price 35*s.*

"The purpose of this atlas," the authors write, "is to try to present to clinicians or pathologists beginning the study of neuropathology the most important pathological conditions in a clear and simple way. It is intended for use in conjunction with the examination of actual specimens and preparations, with a systematic course of lectures or a textbook of neuropathology."

The 262 photographs and diagrams, about half of which are of macroscopic brain specimens, are excellently produced, and very well selected for the purposes of elementary exposition. Effective use has been made of colour photography, notably in the illustrations of meningitis, kernicterus, and the sections of pituitary adenomata. There are a number of helpful diagrams, as, for example, those explaining the effects of intracranial space occupying lesions, or the shear strains in head injuries. The general plan of the atlas is that the left-hand page gives a brief comment upon the subjects that are illustrated on the right-hand page, and this method makes for easy reading. There is so much sound teaching in this volume that one hesitates to complain that the needs of the post-graduate student have been underrated. Yet one cannot but reflect that, in an atlas intended to supplement a textbook, the authors have not altogether grasped their opportunity to produce, not indeed a work of reference, but at least a fairly comprehensive set of microphotographs. Schilder's disease, cerebellar lesions and the amaurotic idiocy group of diseases, for instance, are quite inadequately represented.

Readers for one of the more exacting diplomas in psychological medicine would certainly welcome a little more detailed information of this sort, and this could be easily supplied in a later edition without extra expense by sacrificing some of the illustrations that so often appear in students' textbooks, such as the pictures of massive haemorrhages or some of the better-known tumours.

R. M. Norman.

Observations on the Pathology of Hydrocephalus. By Dorothy S. Russell. Medical Research Council Special Report Series No. 265. London: His Majesty's Stationery Office, 1949. Pp. 138. Price 6*s.*

This authoritative monograph is based upon the autopsy findings in 51 cases investigated by Professor Russell during the past 17 years at the London Hospital and the Nuffield Department of Surgery, Oxford. It is a wholly satisfying account of the very diverse morbid anatomy of hydrocephalus, supplemented by 90 excellent illustrations.

After a short historical survey of the subject, the various types of lesion causing obstruction to the circulation of the C.S.F. are described under the chapter headings of maldevelopments, gliosis of the aqueduct, inflammations, dural sinus thrombosis and thrombophlebitis and neoplasms. A final section deals with the anatomical effects of hydrocephalus, including the false diverticulae and fistulous openings caused by C.S.F. breaking into or through the ventricular walls. Among the many important observations recorded by Professor Russell it is possible to mention in this short review only a few facts of special interest. While the normal range of variation in the calibre of the aqueduct is not precisely known, it is likely that quite a mild degree of narrowing may prove dangerous. Simple stenosis is, however, rare, the commoner form of maldevelopment consisting in a bifurcation of the aqueduct into two narrow channels, one of which often becomes obliterated. On the other hand, occlusion or partial occlusion of the aqueduct by overgrowth of the subependymal neuroglia is not a malformation, but is probably the consequence of widespread low-grade inflammatory change affecting the ependyma.

Hydrocephalus is a common accompaniment of the Arnold-Chiari deformity. Professor Russell contests the theory that the characteristic elongation of the medulla and herniation of cerebellar tissue through the foramen magnum are due to the fixation of the spinal cord at the site of the commonly present lumbar meningo-myelocele. The cerebral malformation may, in fact, be absent in certain cases despite the tethering of the spinal cord within the sacral canal, while it may be present in cases of high spina bifida or meningocele affecting thoracic segments.

Meningeal fibrosis resulting from the action of a variety of non-bacterial agents is a pathogenetic factor common to many obscure forms of hydrocephalus. In some varieties of lipoidosis affecting the nervous system, as, for example, in gargoylism, irritation and proliferation of the arachnoid cells due to the presence of particles of abnormal lipoid may lead to interference with the circulation of the C.S.F. through the subarachnoid spaces. Similarly, adhesions in the subarachnoid space or even in the ventricular system itself may follow the meningeal haemorrhages of birth injury or the subependymal bleedings of prenatal origin which are sometimes found in premature infants. Mention is also made of the post-meningitic varieties of hydrocephalus that are seen in early infancy, this type of illness being of an unusual clinical pattern which is often overlooked. There is, furthermore, the interesting possibility of intrauterine meningeal infection occurring in cases where prolonged labour is associated with maternal infections of various sorts.

In conclusion, let a word of gratitude be said to the author of this finely illustrated and highly instructive monograph for refraining from having it published as an expensive volumn of Teutonic proportions. In its present comparatively modest form it is astonishingly good value for six shillings, and will be bought and read by all pathologists. R. M. Norman.

Psychological Medicine. By Desmond Curran and E. Guttmann. Third edition. Edinburgh: E. & S. Livingstone, Ltd., 1949. Price 12s. *6d.*

The third edition of this very popular introduction to psychiatry has had additions made to the sections on Mental Deficiency, Schizophrenia and Hysteria.

In the chapter on schizophrenia it is gratifying to see paranoia separated from paraphrenia. The former, although certainly an uncommon condition, is quite a different clinical condition from paraphrenia.

In the chapter on the legal aspects of mental illness, the authors on p. 212 might have mentioned the usual method of discharge of a private certified patient, i.e. by order of the petitioner, and that this also applies to a temporary patient, only in this case it is the individual who makes the application for temporary treatment of the patient who is able to order his discharge. The chapter on legal aspects might well be expanded in the next edition without adding much to the size of the book.

This still remains the best short textbook on psychological medicine, and it is with a very deep regret that we mourn the death of Dr. Guttmann who has been an ornament to British psychiatry since he came to this country.

G. W. T. H. Fleming.

An Introduction to Physical Methods of Treatment in Psychiatry. By William Sargant and Eliot Slater. Edinburgh: E. & S. Livingstone, 1948. Price 10s. *6d.*

The second edition of this excellent book is an improvement on the first edition. A chapter has been added on the treatment of the epilepsies by Denis Hill.

The chapters on insulin treatment, E.C.T. and prefrontal leucotomy have all been extended. In discussing the use of E.C.T. in schizophrenia, the authors wisely point out that it is of little use " hammering away at the patient with repeated convulsions " if obvious benefit has not been derived from the first few fits. In involutional depression it is emphasized that high blood pressure or advanced age are not contra-indications if the treatment is justified on other grounds. We do not altogether agree with the remarks about out-patient E.C.T.—we have found patients going back home and undoing all the good done, by overwork at home. Rest in hospital is a useful adjunct, especially in these trying times, when the housewife's lot is far harder than it has ever been.

Work on prefrontal leucotomy and its various modifications is proceeding at such a pace that it is almost impossible to keep up with it. From our experience, we thoroughly endorse the authors' statement that " the better preserved the personality and the more reluctant the doctor is to use such a drastic treatment, the better the end-result will be."

The chapter on the treatment of the epilepsies is very well done.

G. W. T. H. Fleming.

Chronic Invalid. By Phyllis A. Baxter. London: Longmans, Green & Co., 1949. Pp. 117. Price 6*s*. 6*d*.

It is difficult for a serious scientific journal to review a book of this type. It is a vague, diffuse and semi-mystical sort of appeal to the sick to heal themselves, based on the spiritual and emotional experiences of a chronic invalid who claims to have cured herself of her—unspecified—illness by thinking and striving in a particular way. The importance of the emotional attitude of the patient is recognized, and the book may be a help and comfort to some patients.

E. S. Stern.

Man's Quest for Significance. By Lewis Way. London: George Allen & Unwin, 1948. Pp. 211. Price 12*s*. 6*d*.

This is an attempt to view social and economic questions psychologically. Like many amateurs, the author is strongly attracted by Adler's theories. The first part of the book purports to describe past and present conditions. On page 16 there is the extraordinary statement that before the industrial age the yield from the soil scarcely varied from year to year. Has the author really never heard of the disastrous harvests of 1315, 1316, 1438 and 1527, when the price of wheat rose to nearly three to five times the average? Thus prepared, the reader will not be surprised at finding a succession of unwarranted and unsupported assertions.

The latter part of the book, dealing with social, political and economic conditions, is less unsatisfactory; partly because it is concerned with the present, with which the author is more at home, and the future, where we are all equally at sea.

E. S. Stern.

Religion and Psychotherapy. By A. Graham Ikin. Pp. 112.

The Value of Neurosis. By C. Wilfrid Wall. Birmingham: Rylee, 1948. The Thesis Library. Pp. 116. Price 5*s*. 6*d*. each.

The religious attitude to mental disease has altered a great deal since the medieval Church, with its belief in demoniacal possession, and its classification of sloth or " acedia " as a deadly sin, inaugurated the cruel treatment of the insane. Now such bodies as the Guild of St. Raphael concern themselves with spiritual healing. But the conflict between religion and science lingers, and some psychiatrists may believe that the antithesis is so great that it unfits priests for psychotherapy, no less than it should unfrock physicians from the priesthood. Thus the subjects of this notice fail from the scientific standpoint, but they may well prove a comfort to some mental invalids.

In the first of these pamphlets Miss Ikin gives a religio-psychological view of mental disorder. It suffers from its orientation, and is vitiated by facile *a priori* reasoning based on a degree of clinical ignorance. She admits that spiritual healers are prone to mental breakdown, but fails to draw the corollary that this activity attracts the unstable. She would like to see the D.P.M. open to non-medical personnel. Need we say more ?

In the second pamphlet the Rev. W. Wall makes a fair attempt to sum up the schools of Freud, Adler and Jung, whom he prefers. But this again lacks precision and relevance owing to insufficient clinical training. The writing is careless.

Both the authors' names are followed by the initials " Ps. F." It would be interesting to know their significance and the credentials of the body that grants them.

E. S. STERN.

Contributions to Psychoanalysis 1921-1945. By MELANIE KLEIN. Pp. 416. London : Hogarth Press, 1948. Price 21s.

The publication in book form of most of Mrs. Klein's papers is an event, for she occupies a unique position in psychoanalysis. To an extent she has split the movement by her heresies but, remaining within it, she has not been met by the full odium psychoanalyticum. Her work with children is characterized by full interpretation to the patient, which has been criticized by Anna Freud because it is possible that such interpretations may come from the therapist's rather than the child's unconscious mind. On the other hand, it may be held that the authoress is right, as against Miss Freud, in insisting that the analyst must refrain from teaching. Perhaps a combination of these two procedures is inclined to produce too strong a super-ego.

This collection falls into two principal parts : the psychoanalysis of children by play technique, and the concept of manic-depressive disorder which has followed from this. Besides papers on infant analysis, there is an excellent one on the early stages of the oedipus conflict, with an explanation of female character formation, and important ones on child development, the rôle of the school in this, on intellectual inhibition, including a contribution to the understanding of backwardness, and on infantile anxiety. These early papers still read exceedingly well, except for two on criminality, which are rather superficial, and now transcended by the researches of the late Kate Friedlander. The classical papers on mourning and the psychogenesis of manic-depressive states are of course included, with their development of the concept of the depressive position.

Naturally there are weaknesses. Mrs. Klein attributes to unconscious factors those cases of early childish scholastic success followed by comparative failure. But surely a more likely explanation is that early school success depends more on memory and later success on " g." Admittedly it is conceivable that such imbalance is itself due to unconscious factors. She is puzzled by the child's apparently meaningless repetition of his questions. Is not this simply due to his wish to reassure himself of the consistency of the adults and so of the constancy of the external world ?

But there are many excellencies. Every adult should mark her statement that " There is *no* child without difficulties, fears and feelings of guilt, and even when these seem to be of small importance, they cause much greater suffering than would appear, and are in addition the early indication of much greater disturbances in later life." She points out that children's accidents are often due to the desire for punishment for oedipus guilt. She postulates the development of the super-ego as soon as the child makes his earliest introjection of his objects, and that of the oedipus in early infancy and before the age of three to five years given by Prof. Freud. She explains the frequency of paranoid symptoms in melancholia by saying that the difference between the two psychoses is that between the anxiety of introjecting dangerous substances in paranoia and that of destroying internal good objects by biting or chewing, or endangering them by introducing bad substances from within in melancholia. She explains the intractability and ineducability of schizoid and paranoid persons by their fear of reality and the external world, which they must deny in order to remain in their phantasies.

The authoress's forceful personality is well conveyed to the reader, and her ideas are so thoughtful and stimulating that no thinking psychiatrist can afford to ignore them. The papers are well illustrated by case-histories, but, as is usual in studying psychoanalytical works, the reader should, while perusing it, himself carry out analyses of patients by means of the free association technique. E. S. STERN.

Orthopsychiatry 1923–1948: Retrospect and Prospect. Edited by LAWSON G. LOWREY and VICTORIA SLOAN. American Orthopsychiatric Association, 1948. Pp. viii + 623. n.p.

The American Orthopsychiatric Association was founded on 13 January, 1924. After the psychoanalysts, whose delvings they have made fruitful, they have been the greatest contributors to recent psychiatric progress, though strangely little seems to have been known of them on the Continent. Theirs is an eclecticism of the best type, the Horatian *Nullius addictus jurare in verba magistri* (not pledged to swear by the words of any master), selecting the best from other schools as well as their own. To them we owe psychiatric social work, and most of our practice of child psychiatry.

This quarter-century volume is in four parts: developmental, interpenetration of disciplines, functions and practices, and appendix on child psychotherapy. Naturally, in a book by 31 authors, contributions are uneven. The dullest are mere almanacks of orthopsychiatric advance, but the best, which are noticed here, include comprehensive reviews full of stimulating ideas.

Healy and Bronner describe the inception and development of the child guidance clinic, and the beginnings of systematic psychiatric treatment of delinquency in 1908. The pioneers had nearly everything to learn, and it is seen how the paramount importance of the emotional over the physical factors was increasingly appreciated. It is a fascinating story of triumph through perseverance that continues to influence psychology in all progressive regions. Stevenson explains how in 1920 the child guidance clinic attained its standard triad of psychiatrist, psychologist and psychiatric social worker—of whom the last is the greatest of the three—with the psychiatrist as director. Karpman's review of the literature of delinquency treatment is sound, except that he is a little unfair to Burt's "Young Delinquent." Admittedly its outlook is a little static, but its literary style and statistical approach are attractive, and more than any other book it inspired the reviewer, for one, with the idea that fruitful psychiatric research was possible.

Henry discusses anthropology and orthopsychiatry cogently under the headings of "Culture and Symptom Formation," "Destabilization," "Manipulation of the Environment," "Delinquency," quoting Tipping:

> "The pseudo-social or 'gang' boy . . . may be said to be socialized within a delinquent group. . . . The pseudo-social may be regarded as a cultural minority group adopting the way of life which is parasitic and predatory upon our culture.

which is reminiscent of Trotter, "Society versus the Instincts," "Psychotherapy and Cultural Adjustment," and "Aggression"—a word which seems to connote something less reprehensible to the Americans than to us, as was seen at the 1948 International Congress of Child Psychiatry in London. Madeline Moore shows how great is orthopsychiatry's contribution to family case-work, and she has an appreciation of economic, social and physical as well as psychiatric factors. Meltzer makes a liberal contribution on the outlook for orthopsychiatry in industry, quoting Shapley's dictum, "Civilization is endangered by strong physics and weak sociology." Cole points out that the scientist is popularly regarded as a blend of Prometheus, Jove, Messiah, and Faust, but that the reality is chasteningly different. Margaret Mead, writing on the same subject of the rôle of the scientist in society, exposes the fallacy that "in the field of human relations each generation has characteristically thought of itself as well informed and well oriented."

Schumacher gives a thoughtful account of the Cleveland Demonstration Child Guidance Centre, which began in 1924 by treating behaviour problems, co-operating with other agencies, and educating professional workers and the public, but expanded later to undertake research and other functions. Allen, of the Philadelphia Child Guidance Clinic, points out that a social worker from an external agency is not as good as one's own. In reviewing the Rorschach Test, Beck shows how 'gestalt' it is. An excellent survey of projection techniques is made by Rosenzweig. Ethel Ginsburg debates how far the psychiatric social worker should undertake therapy. But the book's outstanding chapter is Margaret Gerard's on Direct Treatment of the Child. Such treatment is usually necessary for deep psychological disturbances, which are encountered more often in older children, but in the more superficial disturbances general in infants indirect treatment is preferable. She points out that completely uncontrolled play "therapy" leads to licence and character disintegration. Her broad and critical historical review is to be recommended to every child psychiatrist. The only criticism the reviewer has is that she is a little too ready with interpretation, which in a skilfully-conducted case should rather come from the patient than the therapist, although the latter must, of course, give help and guidance. Lowrey states that in 1908 there was little "that could be called a well-rounded study of a young human individual," but this is surely to ignore the works of Friedrich Froebel (1782–1852) and his followers. Nina Ridenour's chapter on the improvement of relations with other professions, the press, dramatic art and commerce is well worth reading.

Finally there is an appendix of clear instruction in child psychotherapy by a psychiatrist, a psychologist, and a psychiatric social worker.

It has only been possible in this review to indicate some of the most interesting subjects covered in this excellent book. It is full of sound psychiatric teaching, and will long remain a source book for the medical historian.

E. S. STERN.

Children in Need. By MELITTA SCHMIDEBERG, M.D. London: George Allen & Unwin, 1948. Psychological and Social Series Ltd., No. 7. pp. 196. Price 12*s*. 6*d*.

Five years ago Dr. Marjorie Franklin, the authoress, and Miss Ethel Perry founded the Psychopathology and Psychotherapy Study Circle, with a nucleus, including the reviewer, from the I.S.T.D. Papers were read by members and discussion was free and informal. It was apparent that some contributions deserved publication, and this is a worthy member of that valuable series.

Dr. Schmideberg describes the poor emotional environment in many children's "homes." She is justly critical of the Home Office enquiry into a L.C.C. Remand Home. Such inquiries might be better conducted by an entirely independent body, for the fault with both authorities is that of remote control. She also exposes the futility of most modern penal methods, of the failure to educate and help incompetent parents who come before the courts, of the over-ready resort to adoption of illegitimate children, of the movement of children from one institution to another, of the separation of brothers and sisters, and of the inadequacy of institutional staffs.

The English of the book is not impeccable, but Dr. Schmideberg writes with such passionate sincerity that it is easy to read. Indeed, this is both its strength and weakness, for the writing is sometimes from the heart rather than from the head. Much information seems to have come from psychotherapeutic interviews, and perhaps there is a failure always to distinguish fact from phantasy, or to remember that even the facts have been obtained from the misfits and miscreants of institutional life. The statement on p. 102, that parents who send their sons to public schools rarely give a moment's thought to any alternative, simply is not true.

An excellent chapter by Miss Perry on mentally defective children is really generally applicable, and gives much sound advice on hostel management.

In spite of the minor faults noticed above, the book is attractive, and could be read with advantage by every complacent citizen. It is a pity that the print is so small, for 11-point type precludes its being read at one or two sittings—except by the myopic, but perhaps they need this book most of all.

E. S. STERN.

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On the Initial Impairment of Consciousness following Electric Convulsive Therapy.

(1) The postcomatose impairment of consciousness is during the first 10 min. after the shock, deeper in cases where convulsions have occurred than in cases where the shock has produced loss of consciousness without eclamptic phenomena (*petit mal* seizures). This difference vanishes in the course of the following 30 min. and cannot be ascertained 60 min. after the shock. On the other hand, it has not been possible to ascertain any connection between the dosage and the degree of postcomatose somnolence.

(2) Within the filed " personal data," name and marital state shows the greatest resistance towards the general impairment of consciousness after the shock, while especially the concept of age seems very vulnerable. 10 min. after the shock about 90 per cent. of all the patients are thus able to give the name and marital state correctly, while only 10 per cent. at this time is able to state their age. As late as

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* A number of abstracts in this section are reproduced from *Chemical Abstracts* and *Psychological Abstracts*. To the Editors of these Journals we extend our grateful thanks.

two hours after the shock about 20 per cent. of all the patients are confused as regards their age.

(3) Orientation in space is re-established gradually in the course of the first two hours after the shock and is completely normal two hours after the shock. Compared to this orientation in time seems much more vulnerable. As late as two hours after the shock more than 50 per cent. of the patients are thus unable to state the duration of their stay in hospital.

(4) The power of retention seems to be highly comprised during the hours subsequent to the shock. As late as one hour after the shock only 15 per cent. of the patients are able to retain figures with four digits after distraction of the attention. On the other hand, the power to mobilize previously memorized matter seems only to be slightly reduced.

(5) A retrograde amnesia—measured by the ability to recognize pictures shown to the patient immediately before the shock—is observed in 50 per cent. of the patients 30 min. after the shock. It disappears in the course of the following hours. However, the period covered by the amnesia does not seem to diminish gradually; the re-establishment of memory is apparently sudden and total.

(6) Apperception is a constituent part of all the performances on the basis of which it is attempted to elucidate the above mentioned "specific" psychic elements. Besides these tests the patient apperception is evaluated on the basis of his ability to describe pictures shown to him and to name colours and objects shown to him. 30 min. after the shock about 85 per cent of the patients are able to give a satisfactory description of the content of the picture, while at the same time expressing a comprehension of the point of the picture. It appears from this that negative results of simultaneous "specific" tests are not due to disturbances of apperception.

(Authors' abstr.)

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Post-diphtheritic Nervous Complications.	*Hertz, M., and Thygesen, P.*	No. 49
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Paralysis Agitans.

The present investigation on paralysis agitans is based on 194 probands and 162 secondary cases belonging to 79 proband families.

Paralysis agitans of hereditary origin is characterized clinically by a considerable variability in the symptoms. The age of onset in the material varies between 7 and 81 years of age. The average age of onset is 49 ± 1·4 years. Tremor is the most constant and in some cases the only symptom. The incidence of formes frustes in the series is 20 per cent. Mental symptoms of "reactive" or "organic" type occur in approximately 40 per cent. of the patients. No support is found for the hypothesis of a special paralysis agitans psychopathy or psychosis.

No grounds are found for assuming that juvenile paralysis agitans is an independent nosological entity.

The assembled results of the genetic-statistical analysis show that, with a high degree of probability, the mode of inheritance for the paralysis agitans cases in groups I and II (families with secondary cases and the parent crossing unaffected × affected and unaffected × unaffected respectively) is monohybrid autosomal dominance. It is pointed out that in Group II it is probable that there is a number of families in which the loss of secondary cases is particularly apparent. The parent combination unaffected × unaffected is therefore presumably an artefact (at least in the majority of cases) and the two groups represent the same nosological entity. The Mendelian figure is about 30 per cent. The main explanation of the fact that the expected Mendelian figure of 50 per cent. is not reached is the occurrence of inhibitions of manifestation. The degree of manifestation is estimated to be approximately 60 per cent.

In respect of Group III, containing solitary cases, it is pointed out that it presumably consists of cases both of hereditary and exogenously conditioned origin. These cannot be differentiated clinically, nor is it possible to determine their respective proportions in the group. It is therefore impossible to make any statements regarding the mode of heredity in the hereditary cases in Group III.

The only tenable criterion for the diagnosis of hereditary paralysis agitans is the demonstration of secondary cases.

An investigation of the expectation of the disease in the healthy siblings of the probands definitely speaks against the occurrence of heteropheny in the wider meanings of the term in paralysis agitans.

The occurrence of secondary cases in the families belonging to the groups of arteriosclerotic Parkinsonism and Parkinsonism indicates that the possibility must be envisaged of a coincidence between paralysis agitans and cerebral arteriosclerosis, and that there are different forms of hereditary Parkinsonism. Another plausible explanation is that Parkinson syndromes of varying natures can occur in families with a hereditary susceptibility of the extrapyramidal system.

(Author's abstr.)

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A Study of One Thousand Psychotic Veterans Treated with Insulin and Electric Shock.

1. One thousand psychotic veterans were given electric shock therapy, insulin shock therapy, or a combination of the two in sequence following a period of observation during which they had revealed no tendency toward spontaneous improvement.

2. The large percentage of social recoveries obtained in this group testifies amply to the efficacy of the shock therapies in the treatment of functional psychotic reactions incurred in wartime.

3. The therapeutic superiority of insulin shock is revealed in the greater number of social recoveries obtained both when it is used alone and following unsuccessful treatment with the electric shock. Insulin is definitely more effective than electric shock in the treatment of paranoid and catatonic schizophrenia. The remissions attained from insulin treatment are more lasting.

4. Psychotic reactions precipitated under the stress of combat which had not improved spontaneously responded somewhat better to shock therapy than those patients whose psychotic reactions were precipitated under non-combat, environmental stress.

5. The well-integrated prepsychotic personality proved to be of favourable prognostic significance.

6. The more favourable rate of recoveries reported in this study may be related to the fact that the veterans constituted a selected group of young men in whom the psychotic reactions were precipitated under great emotional stress.

(Authors' abstr.)

Follow-up Studies of Shock Treated Patients.

In the affective disorders, convulsive therapy so greatly shortens the illness that its choice can hardly be questioned. Maintenance of general health and nutrition, prevention of exhaustion, avoidance of long hospital residence and reduction of suicide are among the advantages. It is quite true, as mentioned in recent publications, that a mild excitement or depression can be managed without shock therapy. But in severe cases, treatment is best started as soon as diagnosis is complete. Delay only lengthens hospitalization and magnifies the risks inherent in the psychosis. No evidence was developed that the manic depressive cycles occur with greater frequency following convulsive treatment. It seems doubtful that the succession of attacks is much altered.

Only 1 of 199 schizophrenics and 2 of 149 cyclic depressions in this group were suicides, one of these in a later attack, possibly preventable. The risk of suicide is greatest after the first one or two shocks. Several such attempts occurred, none of them successful. Though neither insulin nor convulsive therapy finally answers the problem of schizophrenia, patients who have had either or both have apparently maintained a better level of function for a longer time than patients not so treated, and remissions which might have occurred spontaneously have been hastened. It is true that considerably higher spontaneous rates in schizophrenia have been reported recently than before. One wonders whether "schizophrenia" has not been too often diagnosed, and if some cases so named have not really been affective disorders. Every effort had been made in this series to exclude all doubtful cases.

Inasmuch as electric shock can be given more rapidly and simply, it seems rational that most schizophrenics should have its use tried first, reserving insulin for those cases not improving. Routines of both types of treatment should perhaps be somewhat longer than the average here mentioned.

Shock treatments are adjuncts and nothing more in the treatment of neuroses. They can best be used for relief of specific symptoms only, with realization by both the patient and the physician that they are no solution of the basic trouble.

The necessity for accurate diagnosis remains. The shock therapies have a great field of usefulness, but one still needs to know what is being treated. In this present period of critical appraisal of the shock therapies, it is to be hoped that criticism of their abuses will not obscure their very real addition to our therapeutic resources. (Authors' abstr.)

Seven Years of Experience with Modified Insulin Treatment in Neuroses and Early Psychoses.

This brief résumé ends with one warning. Weir Mitchell developed a very successful treatment of neuroses in the American Civil War after he had observed that "those who had fought gallantly with Sheridan and Grant" could become "as hysterically emotional as the veriest girl" under continued loss of weight and wounds. Patients were greatly helped by his régime of rest, moral talks, heavy massage to the point of sweating, and enormous food intake (the same sort of effects that we now get with modified insulin techniques, but more easily). He stressed that every part of the régime was dependent on other parts for its success. He laid down strict limitations of its use. It was so successful a treatment that for 25 years it enjoyed a world-wide vogue in peacetime practice—even greater than modified insulin to-day. But doctors gradually began to use isolated parts of the treatment for all types of psychiatric patients. They ceased to pick their cases carefully. Too much was expected of the treatment, and people saw inevitable relapses and failures. By 1925 the treatment was dead and buried, partly due to the increasing theoretical importance attached to the psychodynamic aspects of neurotic illnesses. World War II showed us again the importance of attempting to treat, wherever possible, both the physiological and the psychological aspects of neurotic illnesses. A study of Weir Mitchell's indications for his treatment proved very similar to ours for modified insulin. But I fear that to-day history may repeat itself. Modified insulin has enormously increased in popularity because of some if its successes, and it is now too often used as a mere placebo for many unsuitable patients without reference to its precise indications and its many limitations seen in actual bedside practice. We shall have only ourselves to blame if it falls into total disrepute in a few years' time. Then in a third future war somebody else will have to rediscover Weir Mitchell's principles afresh, and try to

emphasize again that good psychiatric treatment may often have to be multidimensional in approach, but must also be extremely selective in the methods and combinations of methods employed for different groups of patients.
(Author's abstr.)

An Orthopedic and Neurological Follow-up Study of Vertebral Fractures in Shock Therapy.

1. Twenty-four patients with vertebral fractures occurring during the course of convulsive therapy were studied approximately 10 years after the initial lesion.
2. Four patients complain of occasional mild, non-disabling backaches. The rest are symptom-free.
3. In no case is there clinical evidence of orthopedic or neurological sequelae to the original injury.
4. In 3 cases x-ray findings indicate an increase in the original pathology involving the thoracic vertebrae.
5. Patients with vertebral fractures tolerate subsequent convulsive therapy satisfactorily.
6. No curare was used either in the original or subsequent convulsive therapy.

(Authors' Abst.)

Effect of Electroconvulsive Therapy on Water Metabolism in Psychotic Patients.

Changes in salt and water balance in patients given ECT are mediated by various mechanisms. Apparently increased secretion of 3-ketosteroids occurs in patients who show clinical benefit after shock; however, this is only a side reaction and is important only in pointing to the increased production of steroid hormones. That other effects of steroid hormones may be responsible for clinical improvement after shock therapy is suggested by available data. It is probable that the therapeutic effect of shock is reparative rather than destructive. (Authors' abstr.)

A Note on the Validity of Wechsler-Bellevue Scatter.

It is concluded (1) that the index score as a measure of Wechsler-Bellevue scatter empirically derived for this study shows a significant difference between normals (not patients) and neurotics, and between neurotics and psychotics; (2) that an estimate of progressive seriousness of psychological disturbance based on psychiatric diagnosis is reflected in an increased index score for two separate hospital populations; and (3) that the index score is an estimate of level of adjustment as evidenced by its ability to discriminate significantly between in-patient neurotics and working out-patient neurotics. (Authors' abstr.)

The Incidence of Allergy in Psychotic Reactions.

A control group of 757 personnel and a test group of 1,875 neuropsychiatric patients were surveyed for symptoms and signs of allergy. In order to validate the material, the survey was made when an allergen (Ragweed pollen) was a common environmental circumstance for both groups in the same geographical location. The survey, by history, among the control group revealed an incidence of major allergic symptoms of 21 per cent. and an incidence by physical signs of 13 per cent. This group represented a cross-section of the population for the area in which the study was made. Among the test group of patients, the majority of whom were psychotic, the incidence of symptoms by history was 5·7 per cent., and the incidence of positive physical signs, 2·9 per cent. The incidence of physical signs among schizophrenic patients was 2·9 per cent and among manic-depressive psychotics 1·4 per cent. Among epileptics it was 13 per cent. and among organic psychoses 3 per cent. The survey is considered valid since it was made under controlled conditions, the findings were objective, and the survey is open to repetition.
(Authors' abstr.)

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Observations on the Histopathology of Schizophrenia.

1. Ten selected cases of schizophrenia from a group of 60 have been studied clinically and pathologically with special emphasis on the cortex.

2. Although the gross appearance of the brain was not at all distinctive, the microscopic picture was such as to suggest the diagnosis.

3. The main microscopic findings were: Focal and general loss of nerve cells, especially in the anterior half of the brain; the presence of numerous nerve cells showing degenerative changes, such as shrinkage, vacuolization of cytoplasm, "ghost-cells," loss of polarity, and fatty infiltration. A fairly uniform hyperplasia and hypertrophy of macroglia was noted. A diffuse, mild, subcortical demyeliniation was present.

4. There was involvement of the mesodermal components of the brain.

5. An increased array of evidence in many related fields is accumulating to bolster the contention that schizophrenia should be included among the "organic psychoses." (Authors' abstr.)

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Vocalization and Arrest of Speech.

There is a zone in the sensorimotor convolutions of each hemisphere in which vocalization, lip movement and tongue movement are represented bilaterally. These areas may be called the word articulation zones. If one zone is removed, the functional activity of the other makes speech possible, although there may be transient anarthria.

Without discussion of the temporal lobe, and without referring to clinical opinions of aphasia, it may be pointed out that the authors' evidence indicates the presence of a frontal speech area and a parietal speech area in the dominant hemisphere. The functional integrity of these two areas is essential to the mental processes involved in speaking. These two speech areas might be considered a second motor and a second sensory area corresponding to the sensorimotor zone for the lips, tongue and vocalization. But the essential neuronal connections between these second speech areas and the sensorimotor zone as well as the dominant arm area, can be removed without producing aphasia. Consequently, the essential neuronal connections of the second speech areas must be via subcortical pathways to the sensorimotor word articulation area of the rolandic convolution on both sides. (Authors' abstr.)

Effect of Carbon Dioxide on Acrocyanosis in Schizophrenia.

Administration of carbon dioxide causes disappearance of the acrocyanosis of schizophrenia. Dilatation of acral cutaneous capillaries, terminal arterioles and probably arteriovenous shunts occurs. The findings indicate that abnormal vasoconstriction apparently consequent, at least in part, to unpleasant emotional stimuli is responsible for the acrocyanosis which may occur in patients with schizophrenia. There is nothing to suggest the association of abnormal rigidity of the vascular system with this disorder. Acrocyanosis may be present over a period of several decades without loss of responsiveness of the vessels involved. Similarly, the findings do not support the view that a specific structural change is present in the vascular system of patients with schizophrenia. (Authors' abstr.)

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Acid Phosphates in the Senile Brain.

Staining or, better, impregnation of nerve cells, neurofibrils, and especially senile plaques was obtained by methods used for the demonstration of acid phosphatase activity in tissues. This means more than just another way to demonstrate these elements. It indicates definitely an enzyme activity, with the enzyme, the acid phosphatase, located in the parts giving a positive reaction. It can only be stated that the senile plaques contain acid phosphatase. As previously pointed out, the intensity of the phosphatase reaction as obtained in sections does not necessarily indicate quantitative variations. However, the fact that plaques always give a strong reaction and the impression that in general the nerve cells in brains of persons with senile dementia seem to stain darker than those in brains of younger, undemented persons, suggest the possibility that the actual amount of phosphatase may increase with old age and with the development of senile dementia. Further studies in this direction are in progress.

The phosphatase found in the plaques and the apparently increased amount of it in senile nerve cells may indicate an increased local production of this enzyme, or an increased storage from the blood, or a shift from other elements in the nervous system to plaques and nerve cells. Some of the observations seem to favour the idea that there is a shift.

It should be noted that, in general, structures in the nervous system which take the silver stain in Bielschowsky and similar preparations give a positive reaction to the acid phosphatase test. (Author's abstr.)

Effects of Electroconvulsive Therapy on Diuretic Responses to Water in Psychotic Patients.

The diuretic response to water has been studied in patients with various types of psychoses before and again after electroconvulsive therapy. Depressed patients who had not been treated or who were in relapse might show retarded diuresis after the ingestion of water, and patients with schizophrenic syndromes might exhibit abnormally accelerated and excessive diuretic responses. The abnormalities were not found with sufficient regularity to be used as diagnostic tests. After electroconvulsive therapy the diuretic response to water was accelerated in all patients who gained weight as a result of treatment and was not accelerated in those whose weight was unchanged. It is concluded that the gain in weight previously shown to be associated with retention of water is not a consequence of increased activity of antidiuretic substances. (Authors' abstr.)

Neurologic Manifestations Associated with Vitamin A Deficiency in Young Ducks. A Clinical and Pathologic Study.

Young Pekin ducks maintained for a period of ten to fifteen days on vitamin A deficient rations manifested muscular weakness, inco-ordination, ataxia and paralysis. The significant pathologic changes in the central nervous system were buckling and twisting of the spinal cord, sliding of the gray and white columns over each other, hemorrhage and necrosis of the gray and white matter, degeneration of the fiber tracts and nerve cells, and intramedullary formation of cartilage and bone. Although the chief etiologic factor responsible for these lesions may be the disproportionate rate of growth between the neural tube and the vertebral column, it is suggested that there is also an alteration in the differential rates of growth of various regions of the spinal cord. It is believed that vitamin A deficiency may affect adversely these growth potentials. (Authors' abstr.)

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NEW YORK NEUROLOGICAL SOCIETY AND THE NEW YORK ACADEMY OF MEDICINE, SECTION OF NEUROLOGY AND PSYCHIATRY.

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Effect of Glutamic Acid on the Intelligence of Patients with Mongolism.

On verbal intelligence tests our group of children with mongolism showed a gain in mental age after six months of glutamic acid treatment which was equivalent to that of children having average intelligence. This gain represented an increase in rate of development which was twice as great as that formally achieved.

Gains were somewhat lower, however, than those reported in a group of children with undifferentiated mental deficiency. Although our sample of children with mongolism is small, a positive trend is definitely indicated, suggesting that glutamic acid facilitates mental functioning in this form of mental deficiency also, acceleration being reflected in an increase of retest intelligence quotients.

Similar gains were not apparent on performance tests during the initial stage of treatment. In a group of defective children (without mongolism) they were secured, although they were less striking than increases on verbal material. During the second six months of treatment, however, performance retest scores increased more than verbal quotients in the group without mongolism. Our present sample of children with mongolism, therefore, may show some gain on motor tests under continued treatment, but it is believed that results with mongolism to date point to a genuine difference in potential response to glutamic therapy, and that physiologic rather than psychologic factors make it difficult for children with this defect to improve their performance on motor tasks.

The pathologic changes in the cord described by Benda may throw light on the different motor responses to glutamic acid therapy in patients with mongolism. In a study of the spinal cords of 12 cases of mongolism, this investigator found a characteristic pathologic picture, ranging from hypoplasia to true fatalism and arrest of development with pathologic differentiation. No normal cords were found, and the pathologic alterations noted were not observed in any case of a large control material of other types of mental deficiency. The pathologic features included insufficient myelination, spongy edema of the white matter, vascular stasis and insufficient myelination of the peripheral nerves. The most unique development defect was an abnormal persistence of the roof plate with junction of the column of Clarke.

The type and degree of pathologic involvement of the cord observed would appear to be ample to explain impairment of the co-ordination of muscular activity. The uniform defect in the column of Clarke (nucleus dorsalis) itself would seem to contribute substantially to the impairment of co-ordinated movement by interruption of the dorsal spinocerebellar fibers running to the cerebellum.

As stated in previous communications, the rationale for the use of l(+)-glutamic acid in the treatment of defective mental function is based on a number of experiments which indicate a particular relation to cerebral metabolism. Weil-Malherbe reported that l(+)-glutamic acid is the only amino acid metabolized by the brain. The experiments of Nachmansohn and his associates, likewise, indicated that the electrical changes during nerve activity are intrinsically connected with the release of acetylcholine. The latter substance is synthesized by an enzyme, choline acetylase. Nachmansohn found that l(+)-glutamic acid has a catalyzing effect on the rate of production of choline acetylase.

According to *in vitro* experiments, then, glutamic acid acts as a catalyst, or stimulant in complex enzyme chain reaction necessary for the production of the electrical nerve impulse.

Since learning depends on the transmission of sensations from the environment through the nerve impulses to be integrated into a state of conscious awareness, it would appear that intelligence depends basically on the degree of conscious awareness. Glutamic acid would act, then, by increasing the degree of conscious awareness, thus facilitating the learning process. When emphasis is shifted to the capacity of a person to learn, the concept of intelligence breaks the bonds of static definition and opens the way to an understanding of the phenomenon on a sound physiologic level.

The present results in the verbal tests, although tentative, because of the smallness of this group of patients with mongolism, reveal nevertheless, a trend similar to our findings in the treatment of undifferentiated mental retardation with glutamic acid. This offers further evidence for a basic physiologic mechanism underlying the learning process, at the same time indicating that the amount of potential mental improvement depends on the relative intactness of the organic substrate of the mind. (Authors' abstr.)

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Clinical Use of E.C. 110, *a New Headache Remedy* (*Preliminary Report*).

E.C. 110 has been very effective, and without serious side-effect, in the relief of migraine and other vascular headaches in a small number of patients. The optimum dose seems to be one to two tablets, taken at the onset of the first warning of a headache. The oral route obviously has many advantages. Further trial seems indicated. (Author's abstr.)

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Considerations on the Origin and the Nature of Cerebral Waves.

Hypotheses concerning the origin and nature of cerebral waves and the general significance of the electroencephalogram were discussed. Reasons are presented which oppose the theory explaining cortical potentials, alpha waves in particular, by the periodic conduction in the cortex of trains of impulses travelling in *reverberating circuits*.

Experimental arguments were presented in favour of the conception identifying cerebral waves with synchronized cellular pulsations, the fundamental autorythmicity manifested by neuronal aggregates of gray matter (analysis of the effects of bulbar and mesencephalic transection and section of the internal capsule; cortical responses to sensory stimulation; the effect of exciting and depressing agents). In order for this rhythmicity of the cortex to be clearly shown and maintained, there is a dynamogenic influence arising from thalamic nuclei, in which the activity is itself sustained by all the "sensitivo-sensoriels" impulses, and also by impulses of cortical origin. Corticodiencephalic interaction is re-enforced by the eventual in-phase relations of thalamic and cortical pulsations when their respective frequencies are close together.

There is no necessity for separating two types of cortical activity, spontaneous and provoked, considered to be fundamentally distinct by their neuronal mechanisms. The differences observed between the oscillographic aspects of the projection and association areas can be explained by frequent disturbances in the activity of the projection areas due to aperiodic volleys of corticocipital impulses arising from sensory receptors.

Cortical waves are probably constituted by the superposition of rhythmic and synchronized fluctuations in neuronal membrane potentials with discharges of axonal impulses, of which these fluctuations in membrane potential, acting as an oscillating catelectrotonus, would be the immediate cause.

The functional significance of the continuous electrical activity of the cerebral cortex is indicated by the habitual association of a discharge of impulses with each pulsation, a discharge which elicits, depending upon the case, a subliminal excitatory effect (which can eventually become supraliminal), or even an inhibitory action, upon the neuronal aggregates in functional relation with the emitting cortical area. (Author's abstr.)

The Electrical Fields at the Surface of the Head during Sleep.

(1) A method of charting the electrical fields at the surface of the head has been described which has proved useful in the localizing of EEG activity during sleep.

(2) A shift of focus of maximum activity from the parieto-occipital region when awake to the frontal lobes when asleep has been described.

(3) More than one focus, both of slow potentials and of spindles, have been demonstrated. (Author's abstr.)

The Influence of the Body Temperature on the EEG of the Rat.

Experiments on curarized rats suggest that:

1. The body temperature affects the electrical activity of the cerebral cortex.
2. The electroencephalogram remains virtually unaltered at rectal temperatures between 32°–39° C.
3. When the temperature is reduced below about 30° C. the amplitude of the EEG also gradually decreases. The electrical activity of the brain virtually disappears at a body temperature of 18°–20° C.
4. A rise of the body temperature to 40°–41° C. increases the general amplitude of most electrical components.

5. When the body temperature rises above 41° C. the amplitude of the EEG diminishes relatively rapidly. At a temperature of 44°–45° C. the electrical activity of the brain disappears. (Authors' abstr.)

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The Electroencephalogram After Head Injury.

(1) Routine electroencephalograms of 324 patients with severe head injury, of whom 241 had developed convulsive seizures after injury, were analyzed with reference to the wave forms and their localization.

(2) Of the epileptic cases 91·3 per cent. and of the non-epileptic cases 77·1 per cent. had abnormal tracings. The maximum abnormality was restricted to a relatively small area of one hemisphere in 83·8 per cent. and 67·5 per cent. respectively.

(3) The most common focal abnormality in both groups was the presence of slow waves, but this was one and a half times as frequent in the epileptic (73 per cent.) as in the non-epileptic (48·2 per cent.) patients.

(4) Paroxysmal (spiking) abnormalities were present in only about one-fifth of the cases, and there was no significant difference between the epileptic and the non-epileptic cases in this regard. It would seem, therefore, that the EEG alone cannot tell or foretell whether a patient with a severe head injury has or will have epilepsy.

(5) About 90 per cent. of the head injuries were unilateral, and in most cases were left-sided (57·8 per cent. of the non-epileptic, 52·7 per cent. of the epileptic patients).

(6) In every case but one the focal electroencephalographic abnormalities were on the side of injury. In almost 40 per cent. of the cases with bilateral injury the electroencephalographic abnormality was unilateral.

(7) In a series of 106 post-traumatic epileptic patients an attempt was made to activate the epileptogenic focus by the administration of metrazol.

(8) Satisfactory focal activation was obtained in 67·9 per cent. of the cases, repeated testing being more efficient than just one test. The focal electroencephalographic alterations induced by metrazol were paroxysmal in 88·9 per cent. of the positive cases.

(9) Intravenous administration was more effective than intramuscular injections of metrazol.

(10) Clinical seizures occurred in approximately 15 per cent. of cases, but not if anticonvulsant medication were given before the test.

(11) In 39 cases the cerebral cortex was explored, at which time the locus of the activated focus was confirmed by either metrazol or electrical activation. Several technics were employed to remove the foci with or without the scar.

(12) Routine electroencephalograms were made on 34 operated cases three months after operation. Of these only 14·7 per cent. had paroxysmal abnormalities, whereas before operation 41·2 per cent. had had paroxysmal abnormalities.

(13) Activated electroencephalograms were obtained on 29 operated cases three months after operation. Of these 51·7 per cent. showed *no* response to metrazol, whereas before operation 82·7 per cent. of these cases had had focal electroencephalographic alterations.

(14) Activated electroencephalography appears to be a useful diagnostic aid in determining the type of seizure, the location of the focus and possibly the prognosis in post-traumatic epilepsy. (Authors' abstr.)

Auditory Hallucinations and Subvocal Speech. Objective Study in a Case of Schizophrenia.

A study of subvocal speech of a patient having auditory hallucinations was undertaken by means of amplification of otherwise inaudible sounds from the nose and mouth. It was found that there was marked correspondence between the subvocal speech as heard by the investigator and the voices heard by the subject. Subvocal speech was of a whispering type, variable in distinctness and altered in quality from her voluntary whisper. It was incoherent ; there was a different rhythm and a faster rate than her external speech. Both inspiratory and expiratory phases of respiration were utilized for production. It varied with the physiologic state of the subject. It was prominent when she was awake and absent during her sleep. Enhancement was produced by preceding audible speech, particularly of an emotional nature. Inhibition occurred with distraction. Its activity was also influenced by sodium amytal followed by caffeine sodium benzoate, both given intravenously. The phenomenon appeared to represent automatic activity of a psychomotor process—of thought and its motor expression involving respiratory and vocal musculature.

An electromyogram of the vocal musculature of the patient revealed increased neuromuscular activity. It is tentatively suggested from work now in progress that in hallucinating patients where the neuromuscular process is not sufficiently intense to produce subvocal speech, there will be found increased muscle potential of the vocal organs. Thus by the use of the electromyogram an objective criterion can be established for the presence of auditory hallucinations where subvocal speech is not manifested. (Author's abstr.)

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A Statistical Analysis of 480 Army Psychiatric Casualties.

(1) Fifty-seven and three-tenths per cent. of patients showed evidence of predisposition to psychiatric illness to military service.

(2) The lower predisposition for officer and female personnel, than for enlisted and male personnel, was a reflection of the more exact screening used for these groups.

(3) Officer personnel required a significantly greater degree of external stress prior to development of psychiatric illness than enlisted personnel.

(4) Female personnel developed psychiatric illness in large amount, in response to the lowest degree of military stress.

(5) Psychoneuroses were the most prevalent psychiatric illness, being greater than the total of all other diagnoses.

(6) Anxiety reaction was the most frequent type of psychoneurosis.

(7) Schizophrenia was the most frequent type of psychosis (50 per cent.).

(8) Paranoid schizophrenia was the type most common in officers, and catatonic schizophrenia the type most common in enlisted personnel.

(9) The incidence of manic depressive psychosis was over three times as great in officers as in enlisted personnel.

(10) The uniform occurrence of psychosis, unclassified, in officer, enlisted, male and female personnel is suggestive of a preponderantly stressful rather than predisposing etiology for this disorder.

(11) There was a slightly greater incidence of the diagnosis, psychopathic personality, in enlisted than in officer personnel. (Author's abstr.)

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Electrical Activity of the Neostriatum, Paleostriatum, etc., in Parkinsonism and Hemiballismus.

(1) Electrograms were recorded from the neo- and paleostriata and their neighbourhood in ten cases of Parkinsonism and one of hemiballismus. The wave characteristics of frequency, amplitude, form and polarity were compared with (*a*) the corresponding phenomena of concurrently-recorded electroencephalograms obtained from standard scalp leads and (*b*) electromyograms of the tremor-affected limbs. All data derived from the experimental group (here reported upon) were evaluated in view of data and interpretations derived from eleven control subjects (elsewhere reported upon). Twenty-one experiments were performed upon the experimental group and eleven upon the controls.

(2) The frequency of waves derived by the bipolar technique from the several structures of the corpus striatum and neighbourhood varied from individual to individual and from time to time within each individual. The rate of electrograms recorded (by the bipolar method) exceeded that of electrograms derived from the scalp leads (by both the bipolar and monopolar methods) by one to several cycles per second. Similar observations were made among the control subjects.

Short-lived bursts of moderately fast frequency (13-20 per second), having a duration of 0·5–1·0 seconds and a low average voltage interrupted at irregular intervals the slower frequency, higher amplitude waves generally predominating in recordings from leads placed in the corpus striatum. Such were observed in the electrostriatograms of all subjects in both the control and experimental groups.

(3) The amplitude of electrostriatograms obtained by the bipolar technique varied from individual to individual and from time to time within each individual, approximating 14–25 p.v. This was of smaller magnitude than that of electroencephalograms concomitantly recorded by mono- and bipolar techniques from the standard scalp leads, the ratio being as 1 : 2 to 1 : 3.

Evidence at hand suggests that the difference in amplitude between electrostriatograms and electroencephalograms depends upon the smaller quantity of tissue between pick-up electrodes in the former (as compared with the latter), rather than upon the electrophysiologic properties of the cerebral tissues themselves. The findings relevant to amplitude were similar for both the control and experimental groups.

(4) Whether electrograms were derived from scalp-ear or striatum-ear leads that is, by the monopolar technique), the frequency and amplitude of the waves were very similar. This similitude probably arises from the proximity of active cortical tissue of the temporal lobe to the electrode attached to the ear. The non-correspondence which genuinely exists between the electrograms from the two mentioned sources was demonstrable in terms of their disparate temporal relationships and variations in wave form. The phenomena were obtained in the controls as well as in the experimental group.

(5) Electrograms derived from the several deep-lying structures explored (for example, caudate nucleus, putamen, globus pallidus, subcallosal bundle, etc). exhibited no features by which one structure might be distinguished from its fellows. This observation held among both the experimental and control subjects.

(6) Analysis of the phenomena of wave polarity and reversal of electrical sign of the electrostriatograms, strongly suggested that a relatively constant, circumscribed source(s) of electrical discharge obtains within the head of the corpus striatum and/or the putamen. Such a region was almost continuously possessed of an electrical sign opposite to that of the surrounding zones.

Similar findings obtained among the control subjects.

(7) The bipolar electroencephalograms derived from the corpus striatum of four among the ten cases of Parkinsonism exhibited no features by which they could be distinguished from the comparable electroencephalograms of control subjects. Of the six remaining cases, however, five exhibited " fast " runs (rate, 17-23 per cecond ; duration 2–6 seconds ; amplitude comparable to that of the prevailing waves of the record). Such runs frequently interrupted the slower-frequency phenomena generally characteristic of the subject's record. The sixth case, on the other hand, exhibited a singularly slow rate of dominant waves (5½ per second). The source of the latter appeared to be a well circumscribed region in the dorsal half of the caudate nucleus. The phenomena observed in these six cases had no counterpart among the control subjects. It was not possible to identify a consistent relationship between (*a*) the type of electrostriatogram derived from a given subject and (*b*) the kind and degree of clinical features of Parkinsonism exhibited by him.

(8) No relation was apparent between (*a*) the electrical activity of the corpus striatum and neighbouring structures and (*b*) the presence or absence of electromyographic activity and clinically observable alternating tremors. Moreover, when electromyograms corresponding to tremor activity were recorded, their frequencies (4–5 per second) did not correspond to those of the concomitantly recorded electrostriatograms and electroencephalograms.

(9) The electroencephalograms obtained from the one case of hemiballismus in the experimental group did not differ greatly from those of eleven control subjects.

(10) The findings lend support to the hypothesis that, from the patho-physiologic point of view Parkinsonism may differ from case to case in regard to the neural loops usurped. A multiordinal concept of the neural mechanisms involved in the production of tremors and rigidity is suggested, in contradistinction to a unit-factor process (for example, " disease " of the substantia nigra) such as has traditionally been sought in histopathologic terms. (Authors' abstr.)

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Synchronization of Spontaneous Electrical Activity of Cerebrum by Barbiturate Narcosis.

The spontaneous bursts of brain waves which alternate with periods of apparent complete suppression of cerebral electrical activity (" blackouts ") during deep sodium amytal narcosis can originate in either cerebral cortex or either thalamus and be propagated by neuronal pathways throughout both cerebral hemispheres within a few milliseconds. The propagation interhemispherally is by way of the corpus callosum and intrahemispherally by way of the internal capsule and lateral part of the thalamus. (Author's abstr.)

Response of Mammalian Vestibular Neurons to Horizontal Rotation and Caloric Stimulation.

Single functional units have been isolated in the vestibular nerve of the cat and those belonging to the horizontal semicircular canal selected. These units show three types of response to rotation.

Type I.—The discharge is accelerated by rotating to the side of recording and inhibited by rotation in the opposite direction. Of 100 units studied 83 gave this type of response.

Type II.—An excitatory response to rotation in both directions was noted in 12 per cent. of the units.

Type III.—An inhibitory response to rotation in both directions was noted in the remaining cases.

The thresholds were determined for Types I and II and found to vary over as large a range of acceleration as from 5° to 30° per sec.

The response to caloric stimulation was systematically investigated. For the majority of units it followed the rule to be expected from indirect stimulation by movement of the endolymph according to the theory of Bárány. In addition, a direct effect on some peripheral nervous structure was noted, consisting in inhibition by cold and excitation by heat (at the moderate temperatures used). Only a limited number of units were susceptible to this direct effect, which was of very long duration. The indirect effects were transitory. (Author's abstr.)

Characteristics of Electrical Activity of Human Corpus Striatum and Neighbouring Structures.

1. Mono- and bipolar electrostriatograms were obtained from 11 " normal " human subjects having no clinical evidence of " organic " disease of the brain. The frequency, amplitude, form and polarity characteristics of the waves thus obtained were analyzed and compared with concomitantly recorded electroencephalograms derived from " standard " scalp leads.

2. The frequency of waves derived by the bipolar technique from the several structures of the corpus striatum and its immediate neighbourhood varied from individual to individual and from time to time within each individual. The *mode* was 11–14/seconds, with *central tendencies* as low as 6–7/seconds and as high as 17–19/seconds. In general, the frequency of the electrostriatograms exceeded that of the concomitantly recorded scalp leads by one to several cycles per second. Short-lived bursts of waves having a frequency of 12–19/seconds, a low-to-average amplitude, and a duration of between 0·3 and 1·5 seconds interposed themselves at irregular intervals among the more prevalent waves of slower frequency derived from the subcortical leads.

3. The amplitude of waves derived by the bipolar technique from the corpus striatum and its neighbourhood varied from individual to individual and from time to time within each individual. The overall *central tendency* lay between 10 and 35μv. This was of smaller magnitude (by one-half to one-third) than that of concomitantly recorded waves derived from scalp leads by the use of mono- and bipolar techniques. Inasmuch as there was some indication that the amplitude of the electrostriatograms varies directly with the quantity of tissue between pick-up electrodes, it is probable that the findings here noted are the result of the recording methods employed rather than the electrophysiological dynamics of the structures under study.

4. The separate structures of the corpus striatum and its neighbourhood (e.g. the putamen, head of caudate nucleus, globus pallidus, subcallosal bundle, anterior limb of internal capsule, etc.) exhibited no characteristics of *frequency, amplitude* or *wave-form* which might be regarded as distinctive for a particular structure. On the contrary, the waves obtained from the several structures of the corpus striatum and its neighbourhood were characterized by essentially similar frequency and amplitude.

5. Analysis of wave polarity and " reversal of electrical sign " of the electrostriatograms strongly suggested that a relatively constant and circumscribed " source " (or sources) of electrical discharge obtains within the head of the caudate nucleus and/or the putamen. Such a region was almost continuously characterized by an electric sign opposite that of surrounding zones. In all likelihood, the finding of similar frequencies and amplitudes in the waves derived from the various anatomical structures in the corpus striatum and its neighbourhood is a result of the influenced exerted by a " source " of this character.

6. The execution of " voluntary " movements of the ipsilateral and contralateral extremities and delivery of nociceptive excitation (pin-prick) to the skin of the limbs failed to impose perceptible alterations upon the prevailing electrical activity of the several subcortical structures studied. (Author's abstr.)

An Electromyographic Study of Spasticity.

Electromyographic study of spasticity following injury to suppressor systems of the cat's brain indicated that its most characteristic feature was an exaggeration of stretch reflexes, chiefly in antigravity muscles. Threshold was low, response was excessive and its prolongation after stretch was frequent. In addition, tendon reflexes were augmented and repetitive, and commonly induced clonus.

With lesions of single suppressor areas, symptoms were intially pronounced, but diminished with time. After spasticity following lesions of the cerebral or cerebellar cortex had subsided, injury to deep nuclei caused its reappearance. Spasticity was most pronounced and permanent after combined lesions of both cerebral and cerebellar suppressor systems. (Authors' abstr.)

Role of Brain Stem Facilitatory Systems in Maintenance of Spasticity.

The role of central facilitatory systems in the maintenance of the spastic state was studied by observing the effect of injury to these systems in the brain stem of cats with pre-existing spasticity, appraised by electromyographic recording.

Lesions of the basal ganglia or upper brain stem did not significantly diminish the spastic state, but frequently led to its increase. The stretch hyperreflexia of spasticity was considerably reduced by transection of the ponto-bulbar tegmentum and was abolished by additional destruction of the vestibular nuclei.

It is concluded that spasticity is maintained by facilitatory influx to the cord, conducted by reticulo-spinal and vestibulo-spinal tracts, coursing chiefly in the ventral half of the lateral and in the ventral funiculi. (Authors' abstr.)

Effects of Changes in Ionic Environment on Action Potential of a Sympathetic Ganglion.

Experiments have been carried out on the isolated frog superior cervical ganglion to investigate the effects of decreased pH and increased K^+ concentration in the external medium on both the spike and afterpotential complex. Preganglionic stimulation was employed and the potentials were recorded from the ganglion monophasically. The potentials were similar to those recorded from mammalian ganglia, i.e. a spike S, followed by a P_1 wave, and P_2 wave (first and second components of the positive afterpotential.) An N wave (negative afterpotential) was also occasionally present.

It is shown that: (i) Lowering the external pH brings about a decrease of P_1 and increase of P_2 relative to spike voltage. The P_2 wave is also prolonged. (ii) Raising the pH from 7·2 to 7·8 produces complete blockage of transmission through the ganglion, an effect which is counteracted by raising the Ca^{++} concentration of the Ringer solution. (iii) Lowering the external potassium concentration produces effects similar to those produced by lowering pH, i.e. P_1 voltage is decreased and P_2 increased relative to spike height. Spike height also progressively diminishes, and the P_2 wave is prolonged.

Assuming that the interior of a ganglion cell is in Donnan equilibrium with the exterior, much as with a muscle fibre (2), it is shown that a fall in internal pH will be the only significant internal change produced in common by a fall either in external pH or in external $K.^+$ (Authors' Abstr.)

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Psychologic Tension and Serum Iodine Levels in Psychiatric Patients without Evidence of Thyroid Disease.

When a heterogeneous population of psychiatric patients without clinical thyroid disease was divided on the criterion of serum precipitable iodine concentration, a simultaneous qualitative segregation of the population in respect to higher and lower levels of psychologic tension was dicovered. There were statistically significant, though very small, mean differences in serum precipitable iodine concentration between patients with higher and those with lower levels of tension. These findings may reflect gradual increases in thyroid activity (within the "normal" range) associated with repeated psychologically stressful experiences ; and, in turn, the increased neural sensitivity associated with higher thyroid hormone output may help to perpetuate high levels of tension. Increased thyroid secretion may result from the stimulation of anterior pituitary thyrotropic hormone output by adrenergic substances discharged during stressful experiences.

(Author's abstr.)

A Study of Pituitary-Adrenocortical Function in Normal and Psychotic Men.

Report is made of measurement of certain blood and urine constituents determined before and after four tests designed to evoke endogenous adrenocortical activity (glucose administration, pursuit-meter operation, target-ball frustration, adrenocorticotrophin [ACTH]administration) and one test involving the administration of active corticosteroids (ACE). Thirty-six normal men and 34 psychotic men underwent one or more of these tests. Of these procedures the target-ball frustration test proved to be least effective in eliciting blood and urine changes indicative of adrenocortical activity. Data significantly indicative of adrenal cortex activation were obtained for the normal men in the glucose tolerance, pursuit-meter and ACTH tests, whereas significant evidence of responsivity in the patient's data occurred only in the lymphocyte response to glucose administration. The behaviour of the indices of adrenocortical function following ACE was similar in the two groups and they could not be significantly differentiated. It is deduced that the responsivity to ACE is similar in the two groups, but that activation of endogenous adrenocortical secretion generally fails in the psychotic subjects. Evidence is thus provided of a species of hypoadrenalism in the psychotic subjects. The significance of this "hypoadrenalism" is discussed. (Authors' abstr.)

Sex-hormone Relationships in Schizophrenic Men.

Groups of 23 normal men, 11 normal women, and 29 schizophrenic men were compared as to the urinary output of androgen, of estrogen and of 17-ketosteroids. The ratios of these substances to each other were calculated for each of the three groups. There was considerable overlapping in the various categories, but the women were found to have excreted more estrogen and less androgen and 17-ketosteroids than did the men, the difference in the means being statistically valid.

The androgen : estrogen ratio in the men surpassed that in the women in proportion of 16 : 3 to 2 : 3. The proportion of active androgen in the total ketosteroid output was also higher in the normal men than in the women.

In the case of the patients (men) the total estrogen output was lower than that of the women in proportion of 15·8 to 26·8, whereas it was slightly but significantly higher (15·8 to 12·6) than that of the normal men.

The androgen output of the patients surpassed that of the women in proportion of about 12 to 7, but fell significantly below that of the normal men by a ratio of 12 to 18.

The mean androgen : estrogen ratios in the women were 2·3, in the men 16·3 and in the patients the intermediate ratio of 9·7.

In all these various hormonal categories, therefore, the schizophrenic men showed a definite approach toward the feminine patterns, but remained more "masculine" than the normal women.

As regards psychologic characteristics, the 5 patients with the lowest androgen-to-estrogen ratios were less aggressive than the four with the highest ratios. Such homosexuality as was evident was also a matter of more active concern in the latter group. (Authors' abstr.)

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1. Biochemistry, Physiology, Pathology, &c.

Cholinesterases, Cholinergic Symptoms and Sensitivity to Acetylcholine. Heymans, C., *Verbeke, R., and Votava, Z.* [*Arch. intern. pharmacodynamie*, **77**, 486–94 (1948).]

Hexa- or tetraethylpyrophosphate and the dimethylcarbamate of (2-hydroxy-5-phenylbenzyl) trimethylammonium bromide preferentially inhibit the pseudo-cholinesterase in dogs and have little effect on the true esterase. Therefore no symptoms of cholinergic overactivity are seen, but the animal becomes hyper-sensitive to acetylcholine. M. L. C. Bernheim (Chem. Abstr.).

Two Fractions of Specific Cholinesterase Present in Homogenized Normal Mouse Brain. Little, J. Maxwell. [*Am. J. Physiol.*, **153**, 436–43 (1948).]

The specific cholinesterase activity can be separated from homogenized mouse brain by centrifugation into two fractions. One fraction is precipitated maximally from a distilled water homogenate when the concentration of NaCl is adjusted to 0·075 M. Increasing the pH of a NaCl homogenate up to pH 7·5–8·0 causes a further precipitation of this fraction. The activities of the two fractions have the same pH optima; and there is no difference in the relative activities of the two fractions towards acetyl-β-methylcholine, propionylcholine, butyrylcholine, benzocholine and ethyl butyrate. Upon heating at 54° the precipitated fraction is considerably more heat-labile than the supernatant fraction. It appears that the heat inactivation of the precipitated fraction is a second-order reaction.

E. D. WALTER (Chem. Abstr.).

Occurrence and Nature of the Cholinesterase of Snake Venoms. Zeller, E. A. [*Experientia*, **3**, 375–6 (1947) (*in German*); *cf. C. A.*, **42**, 7801*i*.]

An enzyme hydrolyzing acetylcholine, and behaving like the e-cholinesterase (erythrocyte cholinesterase) of mammalian tissues, was found in the dried venoms of 19 species of Colubridae, but not in the venoms of Viperidae (more than 20 species).

MARION HORN PESKIN (Chem. Abstr.).

The Cholinesterase Content of the Blood and Cerebrospinal Fluid of Healthy Children. Verrotti, Irene. [*Med. sper., Arch. ital.*, **12**, 137–44 (1943).]

Cholinesterase was determined by the method of Abdon and Uvnas (*C. A.*, **31**, 5400^5) in the blood and cerebrospinal fluid of 3 prematurely born babies, 7 infants 2 years old or less, and 16 children of 3 to 12 years. The values were: In premature babies 80–85 and 15–16 mgm. per cent. of AcOH liberated in blood and in cerebrospinal fluid respectively, in the infants 47–64 and 12–15 mgm. per cent., and in older children 40–59 and 12–15 mgm. per cent. The ratio of cholinesterase of the blood to that of the cerebrospinal fluid was approximately 4 : 1 for infants, compared to the ratio 3 : 1 that has been reported for adults.

F. FROMM (Chem. Abstr.).

Determination of Cholinesterase Activity of the Nervous System (Concerning a Modification by V. Longo, V. Colaciuri and F. Sorrentino to the Method of Stedman and Stedman and of Pighini). Pighini, Giacomo. [*Med. sper.-Arch. Ital.*, **8**, *No.* 7, 353–62 (1941); *cf. C. A.*, **34**, 3292^9; **38**, 2356^7.]

Pighini concludes that the statement of Longo, Colaciuri and Sorrentino that the aqueous solution or the NaCl solution of acetylcholine or its bromide hydrolyzes spontaneously is incorrect. Since these solutions remain stable for many hours they are stable enough to use during the period in which cholinesterase is determined. Cholinesterase showed highest activity near pH 7. Pighini stated that acid media inhibited cholinesterase activity, and that neutralization of the solution in which cholinesterase is determined only after 14 hours from the beginning of the experiment resulted in a decrease of cholinesterase activity, and therefore inaccurate results. Pighini's own method is sufficiently accurate for the comparison of the cholinesterase of one part of the nervous system with another.

NELLIE M. PAYNE (Chem. Abstr.).

Inhibition of Cholinesterase by Adrenaline. Benson, Wilbur M. [*Proc. Soc. Exptl. Biol. Med.*, **68**, 598–601 (1948).]

Lyophilized preparations of specific and non-specific cholinesterase were fractioned from swine caudate nucleus and parotid gland respectively. Adrenaline inhibited the ability of both enzymes to hydrolyze acetylcholine. The known potentiation of acetylcholine activity by adrenaline *in vivo* can be at least partially due to this inhibitory action on cholinesterase. L. E. GILSON (Chem. Abstr.).

Inhibition of the Cholinesterase of Rat Brain by Methadon. Eadie, George S., Bernheim, Frederick, and Fitzgerald, Dorothea B. [*J. Pharmacol. Exptl. Therap.*, **94**, 19–21 (1948).]

Rat brain homogenate was washed free of blood esterase and suspended in phosphate buffer of pH 7·45. Methadon in 0·005 M or higher concentrations inhibited the cholinesterase. The inhibition was shown to be competitive, and the probable value of the inhibitor-enzyme dissociation constant is calculated to be 0·0004. L. E. GILSON (Chem. Abstr.).

Action of Acetylcholine and Ganglionic Poisons on the Spinal Cord of the Frog. Grebenkina, M. A. [Fiziol. Zhur. U.S.S.R. (J. Physiol.), **34**, *393–6 (1948).]*

In experiments with *Rana temporaris* (both sexes) it was shown that the "praying pose" is induced not only by nicotine, but also by a number of substances belonging to the group of ganglionic poisons—anabasine, carbocholine and acetylcholine. While nicotine is effective at 0·1 mgm. dosage, anabasine requires 0·25 mgm., acetylcholine requires 5 mgm., while carbocholine is applied directly to the bared spinal cord in the form of 0·8 per cent. solution, since direct injection leads to curare-type paralysis. The typical pose is caused by the action of these substances on the cells of the spinal cord, as shown by experiments in which the brain was partially or totally removed without affecting the above described observations. G. M. KOSOLAPOFF (Chem. Abstr.).

The Influence of Thiamine and its Phosphorylated Derivatives on the Sensitivity of Muscle to Acetylcholine. Babskiĭ, E. B., and Minaev, P. F. [Fiziol. Zhur. S.S.S.R. (J. Physiol.), **34**, *389–92 (1948); cf. C. A.,* **41**, *6961e;* **42**, *665i.]*

The frog abdominal muscle was used as the test specimen, which was immersed in the reagent solutions after the establishment of the reference level of response to an eserinized acetylcholine solution (1×10^{-6}–1×10^{-7}). Thiamine at 1×10^{-8}–1×10^{-7} concentration increases and in 1×10^{-4}–1×10^{-3} concentration decreases the sensitivity of the frog muscle to acetylcholine. At 1×10^{-6}–1×10^{-5} it occasionally causes an increase in sensitivity or a decrease. Thiamine monophosphate causes the same effects qualititatively as thiamine, but the changes are less pronounced. Thiamine diphosphate at 1×10^{-7}–1×10^{-3} concentration increases the muscle sensitivity to acetylcholine. The action of thiamine and its derivatives cannot be due to a paralyzing effect of these substances on the activity of cholinesterase. Changes of sensitivity occur in eserinized muscle whose cholinesterase has been previously inactivated. G. M. KOSOLAPOFF (Chem. Abstr.).

Acetylcholine Synthesis in Different Regions of the Central Nervous System. Feldberg, W., and Vogt, Marthe. [J. Physiol. (London), **107**, *372–81 (1948); cf. C. A,* **41**, *6597g.]*

Areas of acetylcholine synthesis parallel acetycholine-containing tissue. The ability to synthesize acetylcholine is considered a measure of the cholinergic fibers in a bundle. The results indicate that some at least of the motor and sensory pathways consist of chains of neurons which are alternately cholinergic and noncholinergic. H. L. WILLIAMS (Chem. Abstr.).

Action of Substances which Antagonize Acetylcholine on the Body Temperature of Mice, Before and After Adrenalectomy. Dutta, N. K. [Brit. J. Pharmacol., **3**, *246–50 (1948).]*

Pethidine-HCl, 30 mgm. per kgm., atropine sulfate, 30 mgm. per kgm., benadryl, 20 mgm. per kgm., and quinidine-HCl, 30 mgm. per kgm., all produce a fall in the body temperature of castrate male mice, and this effect is greater after adrenalectomy. The effect is similar to that found by Peczenik (*C. A.*, **41**, 4577*f*) after procaine. Dutta ascribes the effect to lessened heat production in muscles from anti-acetylcholine action of these substances. JACOB SACKS (Chem. Abstr.).

Action of Acetylcholine on the Refractory Period and Electrical Excitability of the Ventricle of the Turtle and the Frog. Mandoki, Juan J. [Arch. inst. cardiol. Méx., **18**, *425–36 (1948).]*

The action of acetylcholine in concentrations of 10^{-9} to 10^{-2} diminished the absolute refractory period and the electric excitability of the isolated ventricle of *Rana pipiens*, *R. moctezumae* and *Kinosternon hirtipes*.

F. FROMM (Chem. Abstr.).

Sensitization of the Isolated Ventricle of Helix pomatia *to Acetylcholine by Some Local Anaesthetics. Dastugue, G., and Dupuis, P.* [*Compt. rend. soc. biol.*, **142**, 598–600 (1948).]

Compared to the sensitizing action of cocaine-HCl, 1 : 5,000, taken as unity, the relative potencies were, butelline 40, procaine 8, dunacaine 4, tetracaine 4, delcaine 2, eucaine 2, percaine 2, and stovaine 0·5. There is no correlation between this activity and the relative local anesthetic potency.

Sensitization of Denervated Leech Muscle to Acetylcholine by Some Local Anesthetics. [*Ibid.*, 601–3.]

Procaine, cocaine, tetracaine, duncaine, stovaine, delcaine and butelline had a sensitizing action, decreasing in the order given, eucaine had no influence, and percaine had a weak desensitizing action. Eserine 1 : 500,000 diminished all these effects. L. E. Gilson (Chem. Abstr.).

Intellectual Impairment Associated with Brain-injured Patients as Revealed in the Shaw Test of Abstract Thought. Howson, J. D. [*Canad. J. Psychol.*, **2**, 125 (1948).]

The Shaw Test of Abstract Thought consists of four wooden blocks varying in colour, height, shape, size and weight. There are other differences also. On the top surface of each block is one of four names and on the bottom surface one of four letters. The size of holes and notches in the blocks varies. The S is given 9 minutes to grade the blocks in as many ways as possible. Sixty brain injured, 60 neurotic and 60 normal males were given the test. Twenty brain-injured patients matched for Wechsler I.Q. with 20 normals gave a mean number of responses of 5·85, while the mean for the normals was 9·8. The neurotics appeared to be intermediate between the normals and brain-injured.

J. W. Bowles, jun. (Psychol. Abstr.).

Sodium Chloride Retention in Cerebral "Thinness Disease." Hesse, Erich. [*Klin. Wochschr.*, **24/25**, 134–5 (1946).]

NaCl retention of central origin was observed in two cases with undamaged kidneys without edema or diuresis. With daily NaCl intake of 17 gm., only 1–2 gm. was excreted and often only 0·1 gm., but elimination of large quantities took place at intervals. As "thinness disease" is of diencephalic origin, the accumulation and periodic excretion of NaCl may be connected with the diencephalon in conjunction with the liver. B. A. (Chem. Abstr.).

Bilirubinemia after Cerebral Accidents. Furtado, D., and Chichorro, V. [*Arch. intern. pharmacodynamie*, **78**, 229–35 (1949).]

A rapid elevation of the blood bilirubin level occurs after cerebral hemorrhage or subdural hematoma, but not after the occurrence of thrombi or emboli.

M. L. C. Bernheim (Chem. Abstr.).

The Importance of the Pituitary-diencephalon System for the Water and Carbohydrate Balance. Gabel, Oskar. [*Klin. Wochschr.*, **24/25**, 289–93 (1947); *Chem. Zentr.*, , 1947, (**1**), 1024.]

M. G. Moore (Chem. Abstr.).

Brain Diphosphoinositide, a New Phosphatide Having Inositol Metadiphosphate as a Constituent. Folch-Pi, Jordi. [*J. Biol. Chem.*, **177**, 505–19 (1949); *cf. preceding abstract.*]

Crude diphosphoinositide (I) was prepared from brain cephalin as described. After dialysis against distilled H_2O in the cold for 4 days (I) was a white powder, not emulsified in H_2O and insoluble in most organic solvents except wet $CHCl_3$. Yield, 0·5–0·6 gm. per kgm. wet tissue. On analysis (I) was found to be a monophosphate of Ca and Mg containing equimolar proportions of inositol (II), metadiphosphate, glycerol and fatty acids. Neutral equivalent after saponification for 4 hours was about 400. There were 2 atoms of P per molecule fatty acid. All the $CHCl_3$-soluble P became H_2O-soluble after 10-minutes' hydrolysis with 6 N

HCl. (II) diphosphate was isolated from (II) phosphatide by the following procedure : Crude (II) phosphatide was emulsified in H_2O, chilled and precipitated with concentrated HCl. The precipitate, thrice washed with 3 N HCl, was then hydrolyzed with boiling 6 N HCl for 25 minutes. After cooling and filtration the hydrolyzate was evaporated under vacuum. The residue, taken up in H_2O and cleared with charcoal, was then treated with EtOH. On standing overnight in the ice box some material separated which was dried, redissolved, and reprecipitated with alcohol. The precipitate was treated with $Pb\text{-}(OAc)_2$ and then with H_2S. After reprecipitation with alcohol a white powder was obtained in approximately 5 per cent. yield, which was not hygroscopic. Analysis for C, H, P and inositol checked with the composition calculated for (II) diphosphate. (II) diphosphate was also isolated from (I) by suspending (I) in 0·5 N HCl, dialyzing against distilled H_2O for 3 days, hydrolyzing with concentrated HCl for 15 minutes, extracting the hydrolyzate with $CHCl_3$, and treating the aqueous supernatant solution with $Pb(OAc)_2$, etc., as in the preparation from crude (II) phosphatide. (II) was isolated from (I) by the following procedure : (I) was precipitated from aqueous solution with concentrated HCl. The precipitate was re-emulsified and reprecipitated, then hydrolyzed with 6 N HCl under reflux for 48 hours. The hydrolyzate was cooled, filtered and evaporated under vacuum. The residue was dissolved in HOAc, and Ag_2O was added. The supernatant solution was first treated with H_2S, then evaporated and redissolved in EtOH. On standing overnight in the ice box crystals of (II) appeared. The structure of (II) metadiphosphate was established by its chemical analysis by isolation from it of (II), by titration, and by treatment with HIO_4. For the HIO_4 reaction 0·2 m M (II) diphosphate was placed in a 25-ml. volumetric flask, dissolved in H_2O, thymolphthalein indicator added, brought to the turning point with 0·1 N NaOH, then 0·8 m. M HIO_4 was added and the mixture made up to volume. One c.c. aliquots were taken at intervals and titrated with 0·04 N NaOH. To the titrated aliquots were then added 1 c.c. saturated $NaHCO_3$ solution and 0·5 c.c. 20 per cent. aqueous Kl. The iodine liberated was then titrated with 0·04 N H_3AsO_3. At room temperature the reaction was complete in 24 hours, 0·4 m M HIO_4 being used up with the production of 0·18–0·19 m M HCOOH. The orthodiphosphate would be expected to require 3 moles HIO_4 and to produce 2 moles HCOOH, while the paradiphosphate would require 2 moles HIO_4 and produce no HCOOH. Base-free (I) was prepared by acidification and dialysis of (I). It was soluble in wet $CHCl_3$ and wet Et_2O. On titration with NaOH against phenolphthalein, base-free (I) used 1 equivalent NaOH per gm. atom of P, showing that the H_3PO_4 was in the form of a diester with one free acid group. Acid treatment partially destroyed (I). Glycerophosphoric acid could not be isolated. The K salt of (I) was prepared by treatment of the Ca-Mg (I) with K oxalate. It contained 1 equivalent K per atom of P, was insoluble in organic solvents, but aqueous emulsions could be mixed with MeOH or $MeOH\text{-}CHCl_3$ (1 : 2) without precipitation. A variable, small amount of N was present in all (I) preparations. It is held unlikely that N is part of the (I) molecule, but possible that (I) is a mixture of two closely related substances, one of which contains an amine.

ERICH HEFTMANN (Chem. Abstr.).

Complete Fractionation of Brain Cephalin : Isolation from it of Phosphatidyl Serine, Phosphatidylethanolamine and Diphosphoinositide. Folch-Pi, Jordi. [*J. Biol. Chem.*, **177**, 497–504 (1949) ; *cf. C. A.*, **42**, 7249*a*.]

One gm. cephalin, prepared from beef brain, was dissolved in 8 c.c. $CHCl_3$ and 11·8 c.c. EtOH added. A turbidity developed on standing. After centrifugation the supernatant solution containing phosphatidylserine (I) and phosphatidylethanolamine (II) was decanted and the viscous underlayer, the inositol phosphatide (III) fraction, was treated with EtOH. A precipitate formed, which was filtered off and dried. The yield of impure (III) was about 5 gm. per kgm. initial tissue. At about 4°, 1 gm. (III) was dissolved in 12 c.c. $CHCl_3$, 22 c.c. MeOH added, and the mixture shaken for 30 minutes. A precipitate which formed was redissolved in $CHCl_3$ and reprecipitated with MeOH as long as the supernatant solution contained less than 4·5 per cent. P. The final precipitate contained impure (III), yielding about 1 gm. per kgm. initial tissue. Analysis of the supernatant fractions for P, N, inorganic P and amino acid N showed them to contain various proportions of (I) and (II). (I) was isolated from the fractions by evaporation under vacuum, dissolving 17·6 gm. of combined residues in 160 c.c. $CHCl_3$, and addition of 600 c.c. EtOH. On standing on ice overnight 12·6 gm. (I) separated. The supernatant solution was evaporated under vacuum and yielded 5 gm. (II). Ethanolamine (IV) was isolated from this material by emulsification in H_2O, precipitation with concentrated HCl, hydrolysis of the precipitate by boiling 4 N HCl under a reflux for 2 hours, evaporation of the hydrolyzate, and precipitation of (IV) with $Pb(OAc)_2$. After removal of Pb with H_2S the (IV) picrolonate was prepared and hydrolyzed to (IV) hydrochloride. L-serine (V) was isolated from the (I) preparation by emulsification in H_2O precipitation with 0·1 N HCl, hydrolysis of the precipitate by boiling 6 N HCl under a reflux for 6 hours, and evaporation of the hydrolyzate. After decolorizing the residue with charcoal, a p-hydroxyazobenzene-p-sulfonic acid derivative was prepared. This was treated with $Pb(OAc)_2$ and later with H_2S, yielding crystal (V). ERICH HEFTMANN (Chem. Abstr.).

Microchemical Studies on the Nervous System. VII. Cholesterol and Total Proteins of Nerve Undergoing Degeneration. May, Raoul M. [*Bull. soc. chim. biol.*, **30**, 562–6 (1948) ; *cf. C. A.*, **42**, 5486*d*.]

The degenerating sciatic nerve of the rabbit showed a considerable increase in protein and water contents and little change in cholesterol.

L. E. GILSON (Chem. Abstr.).

The Dual Action of Carbamates on the Resting Potential of Frog Nerve. Crescitelli, Frederick. [*J. Cellular Comp. Physiol.*, **32**, 187–210 (1948) ; *cf. C. A.*, **42**, 2329*f*.]

Quantitatively, the pharmacological activity of Et, Pr, Bu and Am carbamates increases with the length of the C chain. The nature of the action is similar in all cases. At concentrations of 0·001–0·1 M they produce an increase of 0·2–4·9 mv. in the resting potential which follows a course indicating adsorption and retention of the drugs at some interphase. The peak potential, which is related within limits to the carbamate concentration, remains constant up to 90 minutes. The positivity returns to normal on washing out the drug. Low concentrations also cause an easily reversible conduction block in all fibers of the sciatic nerve which is not concurrent with the change in positivity. A second effect, which appears at higher concentrations, is associated with progressive depolarization, which produces irreversible conduction block. Ba ions do not antagonize the depolarization without affecting the hyperpolarization. The hyperpolarization appears to be related to decreased permeability. The depolarization probably is a toxic correlate, and is associated with the increased permeability known to occur with toxic concentrations of narcotics. H. L. MASON (Chem. Abstr.).

Thymol and Cephalin-cholesterol Test in Catatonia. Lagergren, Ake, and Gronwall, Anders. [*Monatsschr. Psychiat. Neurol.*, **116**, 185–91 (1948) (*in English*) ; *ef. C. A.*, **42**, 8941*d*.]

The cephalin-cholesterol (I) and thymol (II) flocculation tests and total serum protein (III) were determined at frequent intervals during 8 months in 35 catatonic patients without organic disease. In 11 the (I) test was positive at least 4 times. In only 1 of 459 tests was the (II) test definitely positive, but there was a tendency toward increased (II) values in patients who gave positive (I) tests. There was no correlation between (III) concentration and the (I) test.

WARREN M. SPERRY (Chem. Abstr.).

Studies on the Functions of the Hypophyseal-diencephalic System and of the Ovaries by Means of Radioactive Phosphorus. Borell, U., Westman, A., and Orstrom, A. [*Gynaecologia*, **123**, 186–200 (1947) ; *cf. C. A.*, **42**, 8299*e*.]

Phosphate turnover as measured with P^{32} does not differ between anestrus and estrous female rabbits in the tuber cinereum, adenohypophysis, and ovaries. Castrated animals show an increased turnover in the adenohypophysis, but no increase in the tuber cinereum. A rapid increase in P^{32} turnover in the hypophyseal-diencephalic system accompanies coitus. The hypophyseal diencephalic systems function as a unit, stimulating and regulating ovulation.

RUTH B. PITT (Chem. Abstr.).

Lipides of Peripheral Nerves. Johnson, A. C., McNabb, A. R., and Rossiter, R. J. [*Biochem. J.*, **43**, 578–80 (1948).]

Analyses of peripheral nerves from rabbit, cat, dog, beaver and man reveal that so far as cerebrosides, total cholesterol, and total phospholipide (" essential lipides ") are concerned, they resemble the white matter of the brain, but the nerves contain more sphingomyelin and less cephalin or cerebrosides.

S. MORGULIS (Chem. Abstr.).

The Histochemical Detection of Vitamin C in the Ganglion Cells of the White Rat. Packhauser, Erich. [*Arch. Psychiat. Nervenkrankh.*, **118**, 371–7 (1948).]

Thirty minutes after parenteral administration of vitamin C (I), a positive histochemical Ag test for (I) was obtained in spinal ganglion cells. When trypan blue (II) was given before (I), (I) and (II) were found together in the same cells.

WARREN M. SPERRY (Chem. Abstr.).

Vitamins Antagonizing the Action of Histamine on the Nerves and in Anaphylactic Shock. Lecoq, Raoul, Chauchard, Paul, and Mazoue, Henriette. [*Compt. rend.*, **227**, 1264–6 (1948) ; *cf. C. A.*, **43**, 284*c*.)]

The histamine-induced increase in chronaxia in the rat is antagonized by vitamins A, D, C and P., or C_2 (epicatechin and rutin) and nicotinamide. Of the above only D, C, and P or C_2 (which in addition antagonize acetylcholine) can completely suppress the chronaximetric effects of anaphylactic shock. Thus, in anaphylactic shock vitamin A and nicotinamide antagonize only the histaminic components, and allow the effects due to acetylcholine to persist.

H. P. SCHEDL (Chem. Abstr.).

Studies on the Blood-brain Barrier. (1) *The Basis of Dosage for Animals of Various Weights. Davies, O. L., and Hurst, E. Weston.* [*Brit. J. Pharmacol.*, **3**, 309–14 (1948).]

Although, proportionately to the body weight, the brain is relatively very much heavier in the young animal, dosage on the basis of brain weight nearly always results in the administration of too large amounts of drug. Dosage on the basis of body weight with strychnine and sulfanilamide gave the most nearly uniform results in various mice. With picrotoxin, dosage according to the metabolic-rate formula gave reasonably uniform results. With cocaine no basis of dosage appeared satisfactory for all weights. In the absence of any uniform basis of dosage for mice of widely different weights, the recognition of small differences in the permeability of the cerebral blood vessels of young and old animals would be a matter of considerable difficulty.

H. O. SINGHER (Chem. Abstr.).

Carbon Dioxide, Cerebellum, Chloramines and Convulsions. Silver, Maurice L. [*Science*, **108**, 685–6 (1948).]

In a dog fed on a diet containing agenized flour for three days a convulsion can be provoked by the inhalation of a mixture of 20 per cent. CO_2 and 80 per cent. O. A seizure, whether spontaneous or provoked by CO_2 inhalation, can be recorded by an electroencephalogram from cerebellar leads a few seconds before it is seen in the cerebral cortex.

E. H. KAPLAN (Chem. Abstr.).

The Effect of pH on the Respiration of Brain Tissue ; the pH of Tissue Slices. Elliott, K. A. C., and Birmingham, Marion K. [*J. Biol. Chem.*, **177**, 51–8 (1949).]

Contrary to Canzanelli *et al.* (*C. A.*, **33**, 8761^3), it was found that the true optimum pH for brain tissue respiration is about 7–7·5. The actual pH within slices of brain and other tissues was lower than that of the suspending medium at all pH values above 6.

ERICH HEFTMANN (Chem. Abstr.).

The Chemistry of Nervous Control. Chauchard, Paul. [*Rev. questions sci.* (*Belg.-France*), **9**, 204–23 (1948).]

A review of chemical mediators in the transmission of nerve impulses.

F. H. SNYDER (Chem. Abstr.).

Antihistaminics and Circulation of the Brain. Poupa, Otakar. [*Compt. rend. soc. biol.*, **142**, 1043–4 (1948).]

In rabbits histamine dilates the arteries of the base of the brain and constricts those in the cortical region. Benadryl prevents these effects.

L. E. GILSON (Chem. Abstr.).

Biochemical Development of the Brain of the Chick Embryo ; Nucleic Acids. Bieth, R., Mandel, P., and Stoll, R. [*Compt. rend. soc. biol.*, **142**, 1020–2 (1948) ; *cf. C. A.*, **42**, 8290*e*).]

During the 10th to the 19th day of the incubation period desoxyribosenucleic acid increased in proportion to the increase in cell nuclei of the brain. Ribonucleic acid increased faster, but approximately parallel to the increase in brain proteins, hence it is probably concerned in the synthesis of these proteins.

L. E. GILSON (Chem. Abstr.).

Contributions of Chronaximetric Studies to Vitamin Investigations. Chauchard, Paul. [*Rev. sci.*, **86**, 87–104 (1948).]

A review with 75 references. W. BAUMGARTEN (Chem. Abstr.).

Relationship Between Chemical Structure and Central Depressant Action of α-substituted Ethers of Glycerol. Berger, F. M. [*J. Pharmacol. Exptl. Therap.*, **93**, 470–81 (1948) ; *cf. C. A.*, **42**, 1661*g*, 6461*i*.]

The paralyzing dose and LD_{50} for adult white mice were determined. Many but not all of the compounds produced transient muscular relaxation and paralysis. These effects were due to a depressant action on the central nervous system, and particularly on the spinal cord. The paralyzing action was strongest when R was a benzene nucleus substituted in the o position with a small alkyl or alkoxy group or Cl. Compounds with these radicals in the m or p position were less active. The presence of hydroxy, amino, amido, ester or hydroxyalkyl group, or multiple substitution in the ring with alkyls, halogens, or both, decreased the paralyzing activity. When R was an aliphatic radical, straight-chain alkyls contributed more to the paralyzing activity than the branched-chain isomers or unsaturated radicals. The Am ether was the most potent compound of the aliphatic series. Me substitution on the β C of the glyceryl chain did not materially alter paralyzing activity, but substitution on the α C decreased the activity. Substitution in the hydroxyl groups decreased or destroyed paralyzing activity. The thio and sulfone compounds had paralyzing activity, but were more toxic than the O ethers. The aryl ethers and thio ethers raised the threshold to electric-induced convulsions. There was no simple relation between the anticonvulsant and paralyzing activities of the compounds, and the anticonvulsant activity was not significantly altered by alkyl or alkoxy substitution in the nucleus. Many of the compounds studied also had a depressant effect on blood pressure, reduced the heart rate, had a vaso-dilating action, and exerted a quinidine-like action on the isolated auricle. They did not possess central analgesic action, but had an antipyretic action. Numerous compounds possessed local anesthetic properties, especially the esters of 3-carboxyphenoxy-1,2-propanediol. None of the compounds had a curare-like action.

L. E. GILSON (Chem. Abstr.).

Effect of Acid-base Changes on Experimental Convulsive Seizures. Hendley, Charles D., Davenport, Horace W., and Toman, James E. P. [*Am. J. Physiol.*, **153**, 580–5 (1948).]

Mild metabolic acidosis and severe respiratory acidosis have no effect on the electroshock seizure threshold of rats. Severe metabolic acidosis raises the threshold about 14 per cent., and mild and severe metabolic alkalosis lower the threshold about 7 per cent. Severe respiratory acidosis has no effect on the threshold convulsive dose of metrazole or picrotoxin. Severe metabolic acidosis or alkalosis has no effect on the maximum seizure pattern of rats, or on the resting electroencephalogram, the subconvulsive metrazole EEG discharge, and the threshold for evoked cortical potentials in rabbits. E. D. WALTER (Chem. Abstr.).

Absorption of Glucose in the Stomach Under Extirpation of Individual Sections of the Vegetative Nervous System. Dushko, D. N., and Faitel'berg, R. O. [*Fiziol. Zhur. S.S.S.R.* (*J. Physiol.*), **34**, 367–74 (1948).]

Dog experiments, in which the Pavlov pouch method as modified by Dushko and Aga (*ibid.*, **15**, 245 (1932)) was used, showed that the various sections of the vegetative nervous system have different effects on absorption of glucose in the stomach. Severance at the neck of the left vagus nerve within two weeks gives a definite reaction, shown by a sharp drop of absorption (at times to zero); the right nerve counterpart gives but a very slight effect. Severance, at the neck, of the left sympathetic nerve also has no significant effect, and the same result is obtained in disconnection of the other regions of the vegetative nervous system. Change to the Heidenhain pouch failed to change the results.

G. M. Kosolapoff (Chem. Abstr.).

Skin Disturbances Caused by Vitamin Deficiencies. Fernández, Antonio A. [*Semana méd.* (*Buenos Aires*), **11**, 491–512 (1948).]

A general discussion, with the conclusion that in most cases the picture is complicated by multiple deficiencies and by coexistent pathological conditions.

A. E. Meyer (Chem. Abstr.).

Chronaximetric Antagonism of the Vitamins. Lecoq, Raoul, Chauchard, Paul, and Mazoué, Henriette. [*Compt. rend.*, **227**, 307–9 (1948); *cf. C. A.*, **41**, 2800*d*.]

It has been shown that various vitamins can exercise an antagonistic action towards one another, particularly with respect to their chronaximetric effects as observed on the extensor and flexor nerves of the toes of young and adult white rats. These effects permit the classification of the vitamins into two groups according to their properties: those that depress the chronaxial nerves and thus exert their exciting effect (vitamin A, linoleic acid, choline and adrenochrome), and those which augment the chronaxial nerves and whose effect is depressive (vitamins of the B group, C, D, E, G or B_6, H_1 and H_2, K, inositol, folic acid, epicatechin and rutoside). From observations confined to the four principal vitamins (A, B, C and D) the following conclusions were drawn: The results show that the vitamins can be separated into two groups: (1) Those which neutralize the chronaximetric effects of vitamins A and B (vitamins C, D, F, biotin (H_1), p-aminobenzoic acid (H_2) and choline); (2) those which neutralize the effects of vitamins C and D (vitamin A, the 5B vitamins alone or together, E. K, adermine or pyridoxine (G or B_6), folic acid, epicatechin, rutoside (P or C_2), and adrenochrome). The classification of the vitamins into these two groups is not due to their isolated action on the chronaxia; e.g. choline, which diminishes chronaxia, neutralizes the effects of vitamin A which is in the same sense as the vitamins of group B are in the opposite sense. This classification is in general accord with previous observations on the effects of vitamins on acid-base equilibrium; vitamins A and the B complex are alkaline, C and D are acid in reaction. John R. Clopton (Chem. Abstr.).

Functional Structure of Reflexes. V. Peculiarities of Functional Structures of Reflexes under Influence of Poisons, which Disturb the Normal Co-ordination (Strychnine, Alcohol), and Soporific Substances. Zimkin, N. V. [*Fiziol. Zhur. S.S.S.R.* (*J. Physiol.*), **33**, 61–80 (1947); *cf. ibid.*, **32**, 599 (1946).]

In studies on rabbits and frogs with strychnine 0·01–1·0 mgm. for rabbit, 0·4–1·2 mgm./kgm. for frog), alcohol (rabbits 2–6 ml./kgm. injected rectally, frogs 4–20 ml./kgm. injection into lymphatic sacs), and soporifics (barbital, chloral hydrate, and hexenal), it was shown that strychnine, in acting on the nerve centers, exhibits a considerable effect on the reflex mechanism in rabbits (shaking reflex) by increasing the threshold of some of the reflex components, and decreasing that of others; similar profound changes occurred in frog reflexes; the characteristic of strychnine action is the uneven effect on various nerve centers; the soporific substances listed above increased the stimulus thresholds, and interrupted the transfer of stimuli from afferent to efferent neurons at low levels of excitation; at high excitation levels the reflexes occur with a fairly high order of co-ordination of movements. Alcohol is between the strychnine and the soporifics in its effects; at medium dosage an uneven effect on various nerve centers occurs, similar to that of the strychnine effect, but not as pronounced. In deeper alcohol intoxication, however, the thresholds of excitability rise and the tonic reflexes disappear, showing similarity to the soporific action. G. M. Kosolapoff (Chem. Abstr.).

Post-ganglionic Site of Action of Nicotine, with Special Reference to its Direct Action on Blood Vessels. Haimovici, Henry. [*Proc. Soc. Exptl. Biol. Med.*, **68**, 516–20 (1948).]

In the Laewen-Trendelenburg frog preparation, which is essentially an isolated vascular bed, nicotine induces marked vasoconstriction. Resection of both sympathetic chains and all spinal nerves does not alter this action. The nerve-blocking substances Et_4NCl, curare, and dibenamine do not abolish the vasoconstrictor action of nicotine. It appears that under these conditions the site of action of nicotine is peripheral to the post-ganglionic fibers and possibly directly on the blood vessels. In intact animals it may be assumed that in addition to its known sites of action on ganglion cells and on adrenal medulla, nicotine may also act directly on the neuroeffector cells of blood vessels.

L. E. Gilson (Chem. Abstr.).

The Role of the Diencephalon in Regulating Ocular Tension. Schmerl, Ernst, and Steinberg, Bernhard. [*Am. J. Ophthalmol.*, **31**, 155–8 (1948).]

The oral administration of 1·5 c.c. paraldehyde per kgm. of body weight caused no change in ocular tension in normal or glaucomatous rabbits. The intravenous injection of 30 mgm. Na pentobarbital per kgm. of body weight caused an immediate decrease in ocular tension followed by a return to normal. When 40 c.c. H_2O per kgm. was given by mouth, the increase in ocular tension was more rapid and more pronounced in normal than in glaucomatous rabbits. Paraldehyde did not alter the effect of H_2O in normal rabbits, but augmented the rise in glaucomatous rabbits. Na pentobarbital inhibited the rise in the normal and delayed it in glaucomatous animals. If paraldehyde acts on the cerebral cortex and Na pentobarbital acts on the diencephalon, findings suggest that the diencephalon contains a center for the regulation of ocular tension. This center is affected in glaucoma.

Mary O. Amdur (Chem. Abstr.).

Influence of Ovarian Hormones on the Transmission of the Activity of the Sympathetic Nerves of the Cat. Secker, J. [*J. Physiol. (London)*, **107**, 265–71 (1948).]

Acute adrenalectomy of male cats and of female cats in an- or pro-estrus usually leads to reduced response of the nictitating membrane to sympathetic stimulation. In estrus and pregnancy the ovaries must be removed as well. The reduced response is overcome by adrenal hormone, progesterone and, to a lesser extent, by follicular hormone. H. L. Williams (Chem. Abstr.).

Brain Metabolism in Emotional Excitement and in Sleep. Richter, D., and Dawson, R. M. C. [*Am. J. Physiol.*, **154**, 73–9 (1948).]

The lactic acid content of the rat brain is reduced in sleep and increased in emotional excitement. The rise in lactic acid in the brain in emotion is not due to concomitant muscular activity, since the effect was still observed in animals immobilized by tubocurarine. The brain lactic acid was not raised by muscular exercise in trained animals. The rise in lactic acid in the brain in emotion is a transient effect, followed by a rapid return to normal when the stimulus is discontinued. E. D. Walter (Chem. Abstr.).

The Influence of the Duration of Stimulation of Nerve Cells on the Degree of their Binding of Dyes. Romanov, S. N. [*Doklady Akad. Nauk. S.S.S.R.*, **61**, 761–4 (1948).]

Rabbits were killed by air embolism, following which the spinal nerve ganglia were isolated, immersed at room temperature in Ringer solution and then electrically stimulated in 0·05 per cent. neutral red solution (basic dye) or cyanol (acid dye). On prolonged excitation the ganglionic cells increased their affinity for both the acid and the basic dyes. In the interval of 10–45 minutes the relation was essentially proportional. G. M. Kosolapoff (Chem. Abstr.).

Participation of Enzymic "Permeability Factor" in Nervous Excitation Phenomena. Kohstoyants, Kh. S. [*Doklady Akad. Nauk. S.S.S.R.*, **60**, 1105–7 (1948).]

Hyaluronic acid solutions (from preparations according to L. G. Smirnova, *Uspekhi Sovrmennoĭ Biol.*, (**1**), 302 (1947)) were introduced into frog heart in Ringer solution and the heart was subjected to vagus nerve stimulation. It was found that under these conditions the hyaluronic acid undergoes depolymerization, as shown by lesser coagulating tendency in reaction with proteins and by lower viscosity. The enzymic nature of the process is shown by incubation with or without preliminary boiling. It was shown in a separate experiment that acetylcholine is not responsible for the depolymerization. Atropine inactivates hyaluronidase and retards the depolymerization reaction.

G. M. KOSOLAPOFF (Chem. Abstr.).

Histochemical Studies on the Lipides of the Cerebral Sheath. Valade, Paul. [*Compt. rend.*, **227**, 646–8 (1948).]

The following method for staining tissues for lipides has been devised: Tissue is passed through several baths containing acetone-water (in increasing concentration), $Cd(NO_3)_2$, then through a number of baths of acetone-$K_2Cr_2O_7$, and fixed in paraffin. Then it is stained with Sudan B or Sudan III. The $Cd(NO_3)_2$ serves to reduce solubility of lipides in acetone solution. D. PERLMAN (Chem. Abstr.).

The Phosphatide-cerebroside Fraction of Nervous Tissue. Extraction, Composition and Preparation of Injectable Extracts. Soldi, A., and Claudi, M. Alberti. [*Farm. sci. e tec. (Pavia)*, **3**, 397–410 (1948).]

White nerve substance dried *in vacuo* contains approximately protein 30·6, sphingomyelin 6·69, galactolipides 13·24, cephalin 13·97, lecithin 6·00, cholesterol 18·0, fat 2·0, H_2O 9·94 per cent. The fresh tissue was ground to a colloidal pulp and dried *in vacuo* and freed of cholesterol by extraction with Me_2CO. The exhaustion of the residue with EtOH required 190 hours in a Soxhlet extractor. At 16 hours of extraction the composition of the extract was galactolipides 29, sphingomyelin 24, cephalin and lecithin 46 per cent. The following extracts contained a constant percentage of 6 to 7 galactolipides: The 32-hour extract contained sphingomyelin 46 and lecithin-cephalin 46 per cent. Later the latter fraction increased, but the absolute quantities were small. An injectable preparation was obtained by adding to an extract containing 35·37 per cent. cephalin, 15·34 lecithin, 17 per cent. sphingomyelin and 30·92 per cent. galactolipides, 1/3 volume EtOH, and heating until a viscous mass was obtained, which was poured into the aqua medium at varying temperature. The emulsion in 0·9 per cent. NaCl solution was not stable. Stable emulsions from 2·5 to 10 per cent. in H_2O and 5 per cent. glucose solution were obtained between 50° and 80°. The material was filtered through fritted glass filters. The pH varied between 4·5 and 5·5. The viscosity in glucose was lower than that of the aqueous preparation. Asepsis was observed during the whole process, and sterility was obtained by tyndallization at 75° or heating in steam for 20 minutes. Tests in animals proved the product to be non-toxic and non-allergenic. A. E. MEYER (Chem. Abstr.).

Role of Carbon Dioxide and the Hindbrain in Agene-induced Canine Epilepsy. Silver, Maurice L., and Pollock, George H. [*Am. J. Physiol.*, **154**, 439–42 (1948).]

Inhalation of 20 per cent. CO_2 and 80 per cent. O is synergistic with the toxicity induced by the ingestion of flour treated with NCl_3. It accentuates existing electroencephalographic abnormalities, and can precipitate a seizure in a susceptible animal. These are first electroencephalogram changes seen over the hindbrain, and characteristically occur when the inhalation starts or shortly after it is terminated.

E. D. WALTER (Chem. Abstr.).

Inhibition of Brain Respiration by Ethanol at Varied Temperature Levels. Fuhrman, Frederick A., and Field, John, 2nd. [*Proc. Soc. Exptl. Biol. Med.*, **69**, 331–2 (1948).]

The inhibition of O consumption of rat cerebral slices by various concentrations of EtOH (1·9–9·5 per cent. by volume) becomes progressively greater with time at 38°; such progressive inhibition is less marked at 30° and is absent at 20°.

The minimum effective inhibitory concentration increases with decrease in temperature, and the percentage inhibition with a given concentration of EtOH decreases with decrease in temperature. L. E. GILSON (Chem. Abstr.).

Localization of Brain Tumors with Radio Dyes. (I) Chemical and Physical Aspects. The Synthesis of Diiodo^{131}fluorescein. Boyack, Gerald, Moore, George E., and Clausen, Donald F. [*Nucleonics*, **3**, *No.* 4, 62–3 (1948).]

Details are given of the synthesis of diiodo^{131}fluorescein, made from fluorescein and I^{131}, as an aid in the diagnosis and localization of brain tumors.

(*II*) *Experimental Evaluation of the Physical Limitations. Marvin, James F., and Moore, George E.* [*Ibid., No.* 4, 63–8.]

From four experiments with water phantoms containing radioactive I, it is concluded that brain tumors which retain a concentration of radioactive diiodofluorescein twice that of the surrounding brain tissue can be detected with the Geiger counter. The method of symmetrical counting positions used by Moore (*Science*, **107**, 569 (1948)) proved adequate in phantom experiments. SYLVIA NOWINSKA (Chem. Abstr.).

Regulatory Effect of the Central Nervous System on Protein Metabolism. Schrade, Werner. [*Klin. Wochschr.*, **24/25**, 705–11 (1947); *cf. C. A.*, **39**, 2792[1].]

Studies of blood N constituents were undertaken more closely to relate urinary N excretion to protein-metabolism changes under central nervous system stimuli. Twenty-nine rabbits were given central nervous system stimulation by sub-occipital puncture followed by air filling of the brain ventricle. Blood nonprotein N, (I), urea N (II), α-amino N (III), and total residual N (IV) (calculated as (I)–(II)) decreased in the first few hours after stimulus. This was followed by increases to above normal of (I), (II) and (IV). Uric acid decreased considerably. The plasma proteins and hemoglobin decreased slightly. Urinary N excretion decreased about 50 per cent. for the first day after stimulus. Urine volume decreased and specific gravity increased. JAMES F. HOGG (Chem. Abstr.).

Lipides of the Rat Brain and Liver in Choline Deficiency. Foà, Piero P., Weinstein, Harriet R., and Kleppel, Bernard. [*Arch. Biochem.*, **19**, 209–12 (1948).]

Choline (I) deficiency did not affect the phospholipide, sphingomyelin, lecithin, cephalin, and cholesterol content of the rat brain. (I)-deficiency decreased the lecithin content of the liver, but did not affect liver cholesterol, sphingomyelin, or cephalin. When food consumption was equalized, (I)-deficiency did not affect growth. VERNON L. FRAMPTON (Chem. Abstr.).

Influence of Vitamin E on Muscular Chronaxia of Children. Comolli, Enrico, and Riva, Renato. [*Acta Vitaminol.*, **2**, 90–2 (1948).]

Injection of 30 mgm. α tocopherol (I) caused in 12 normal children no change of the muscular chronaxia (II). (II) was decreased half an hour after acid administration, injection of (I) returned (II) to normal. If (I) was given before acid application, no decrease of (II) was observed. The decrease of (II), caused by 4 gm. $NaHCO_3$, could not be changed by (I). F. FROMM (Chem. Abstr.).

Vitamins and Neurology. Bischler, W. [*Scientia*, **83**, 208–15 (1948).]

The relation of deficiencies of different vitamins to nervous disorders is discussed. L. E. GILSON (Chem. Abstr.).

Cholesterol and Mineral Metabolism in Recent Brain Lesions and Consequent Conditions. Harrer, G., and Loibl, K. [*Wien. med. Wochschr.*, **98**, 409–14 (1948).]

Analyses for Ca, Mg, K, Na, Cl, P and cholesterol were carried out in 41 cases of recent brain wounds and many older cases. The serum levels of the cations were essentially normal even in the presence of severe lesions. A hypercholesterolemia was observed in the more severe cases. Lesions of the thalamus caused an abnormally high serum level of Ca. The K/Ca ratio varied considerably; it decreased in meningitis. Urinary excretion of Cl and total urine volume were usually decreased significantly. ERICH HIRSCHBERG (Chem. Abstr.).

Acid-base Relationship in Brain Tissues. Epshteĭn, Ya. A. [*Biokhimiya*, **13**, 434–40 (1948).]

Fresh rat brains contain 203·9 milliequivs. of base per kgm., which is in combination with the following (milliequivs./kgm.): Chloride 36·2, phosphate 16·1, bicarbonate 12·5, lipide 67·5, amino acids 19·2, lactic acid 7·0 and ascorbic, β-hydroxybutyric, and acetoacetic acids 3·0. The remaining 42·4 milliequivs. are apparently bound to proteins and to unknown acids.

H. PRIESTLEY (Chem. Abstr.).

Disturbances of Neuromuscular Excitability During Alimentary Imbalance and Avitaminoses. XXV. Vitamin Requirements Linked with Metabolism of Lipides and Cholesterol. Lecoq, Raoul, Chauchard, Paul, and Mazoué, Henriette. [*Bull. soc. chim. biol.*, **30**, 296–305 (1948); *cf. C. A.*, **42**, 8896*h*.]

In rats the injection of 1 c.c. of 1 per cent. Na oleate solution produces a decrease in nervous chronaxia, which can be prevented by administration of nicotinamide, pantothenic acid, pyridoxine, methionine, or *meso*-inositol, but not by choline, cystine, or vitamin A. Inositol alone causes an increase in nerve chronaxia after some delay. Injections of a 1–2 per cent. solution of cholesterol in oil cause a decrease in nervous chronaxia, which is prevented by nicotinamide, pantothenic acid, pyridoxine, vitamin A, methionine, inositol, vagotonin, or choline; not prevented by folic acid; and increased by cystine. Also in *Compt. rend. soc. biol.*, **142**, 428–30 (1948).

XXVI. Further Investigation of the Relation Between Vitamins and Acid-base Balance. [*Ibid.*, 306–15; *cf. C. A.*, **42**, 8956*e*.]

In rats linolenic acid, rutin, adrenochrome and adrenaline produce a mild alkalosis; oleic acid, ricinoleic acid, choline and acetylcholine produce a mild acidosis; and the effect of pyridoxine, biotin, p-aminobenzoic acid, inositol, vitamin K, folic acid and epicatechol is uncertain. The effects of these compounds on neuromuscular chronaxia are also discussed. L. E. GILSON (Chem. Abstr.).

The Histamine Content of the Cerebrospinal Fluid in Man. Jackson, Ira J., and Rose, Bram. [*J. Lab. Clin. Med.*, **34**, 250–4 (1949).]

The histamine content of the cerebrospinal fluid was studied in 19 normal and 15 abnormal subjects. The average normal was 0·97γ per 100 c.c., with variations of 0·2 to 3·0γ. Abnormal spinal fluids had an average of 1·43, with variations of 0·5 to 3·0γ. There was some direct correlation between the number of cells present and the histamine content, more marked for polymorphonuclears than for lymphocytes. The underlying intracranial abnormality did not appear directly to influence histamine content. JOHN T. MYERS (Chem. Abstr.).

Entrance of Intravenously Injected Sucrose into the Cerebrospinal Fluid. Hubbard, Roger S., and Zoll, John. [*Proc. Soc. Exptl. Biol. Med.*, **70**, 394–6 (1949); *cf. C. A.*, **37**, 686⁷.]

After intravenous injection very little, sometimes only a trace, of the sucrose gets into the spinal fluid, even in cases of injury of the central nervous system.

L. E. GILSON (Chem. Abstr.).

A Quantitative Turbidimetric Method for the Determination of Spinal-fluid Protein. Bossak, Hilfred N., Rosenberg, Arthur A., and Harris, Ad [*J. Venereal Disease Inform.*, **30**, 100–3 (1949).]

To 2·5 ml. of spinal fluid add 2·5 ml. of 10 per cent. CCl_3COOH (I) and invert to mix. Allow to stand 5–10 minutes and again invert. Determine percentage of transmission at approximately 420 mμ. The turbidimetric procedure using sulfosalicylic acid (II) gave results which agree closely with those obtained with chemical determination when tests were performed on fluids containing normal albumin-globulin ratios. Changes in this ratio altered the total protein value as interpreted by (II) precipitation, but had no appreciable effect when (I) precipitation was used. H. O. SINGHER (Chem. Abstr.).

Calcium in Blood and Cerebrospinal Fluid after Calcium Chloride Injection in Sound and Meningitic Children. Caltabiano, G. B., and Wrzy, G. [*Riv. pediat. siciliana*, **3**, 170–9 (1948).]

Determinations (Kramer and Tisdall method, *C. A.*, **15**, 3681) in 17 sound children (I) 3–8 years old and 10 children (II) 7 months to 9 years old with meningococcic and tuberculous meningitis, before and after intravenous injection of $CaCl_2$ (0·05 gm. per kgm. body weight), showed that Ca, which was 9·4–11·8 and 4·1–5·5 mgm. per cent. in (I), respectively, in blood and cerebrospinal fluid (for (II) the latter value was 4·5–5·5), increases very slightly in the cerebrospinal fluid after the injection, both in (I) and in (II). C. Scandura (Chem. Abstr.).

Organic Phosphoric Esters in Cerebrospinal Fluid Under Normal and Pathological Conditions. Huszak, I. [*Confinia Neurol.*, **8**, 309–11 (1947/48) (*in German*).]

See *C. A.*, **42**, 8910*g*. Warren M. Sperry (Chem. Abstr.).

Ascorbic Acid Content of Cerebrospinal Fluid in Diseases from Poliomyelitis Virus. Spolverini, L. [*Riv. pediat. siciliana*, **3**, 25–32 (1948).]

In children 1–6 years old with poliomyelitis increased values up to 1·8–2·0 mgm. per cent. were always found while the disease lasted. This increase was not related to the extension, severity, or localization of the disease, or to the age of the patient. In 20 children 1–2 years old with pharyngeal tonsillitis increased values also were found. C. Scandura (ehm. Abstr.).

Studies of the Pathological Physiology of the Cerebrospinal Fluid. IV. The Colloidal Chemical Mechanism and Pathophysiological Significance of the Mastic Reaction and a Modification Thereof. Scheid, K. F., and Scheid, Lotte. [*Arch. Psychiat. Nervenkrankh.*, **118**, 316–36 (1948).]

In the serial dilution of cerebrospinal fluid (C.S.F.) as usually carried out in the mastic reaction (I), the resulting variation in pH has a marked effect on the precipitation curve. To avoid this (I) was modified by preliminary dialysis of C.S.F. against phosphate buffer at pH 7·0–7·1 and by use of the same buffer as a diluent. Precipitation is also affected by the total concentration of ions, which was kept constant in the modified (I) at 0·165. The modified (I) was applied to solutions of electrochemically homogeneous albumin (II) γ-globulin (III), and β-globulin (IV), prepared from serum (details of preparation described). (II) gave no precipitate in any dilution. (II) gave a large precipitate in lower dilutions, and the curve was the same as that given by electrochemically homogeneous (III) from C.S.F. (IV) had little effect in low dilutions, but precipitated as the dilution was increased with a maximum at a dilution of 1 : 16, beyond which the precipitate became progressively less. (II) inhibited the precipitation by (III) and (IV) at all dilutions, increasingly as the (II) : (III) or (II) : (IV) ratio was increased. (IV) inhibited the precipitation of (III) in low dilutions, but there was an additive precipitation in mixtures of (III) and (IV) at higher dilutions. Most types of (I) curves found in C.S.F. could be reproduced artificially in solutions containing various proportions of (II), (III) and (IV) (from serum). From the total protein concentration and the type of (I) curve a rough estimate of the proportions of (II), (III) and (IV) in a sample of C.S.F. can be made.

(V) Comparative Investigations of the Colloid Reactions, Their Colloidal Chemical Mechanism, and their Practical Use in Diagnosis. Scheid, K. F., Scheid, Lotte, and Schneidt, Werner. (*Ibid.*, 337–70.]

The gold sol (V) and collargol (VI) reactions were modified by keeping the ionic concentration constant at 0·165 in all dilutions. (I), (V) and (VI) were applied to solutions of serum (II), (III) and (IV) α-globulin in a study of the effect of pH, which was varied, usually from 3·0 to 8·0 in increments of 0·5, in each series of experiments with a different colloidal reaction with protein, but which was kept constant throughout each series of dilutions. Over 1,400 readings of precipitation were made and tabulated according to pH and dilution for each colloid reaction and protein. In general the area of greatest precipitation centered about the isoelectric point of the protein. All of the C.S.F. colloid tests depend upon a reaction of the ionized colloids with proteins. The modified (I) and (V) reactions give similar results, but (V) is more sensitive to (III). The (VI) reaction gives less clear-cut results. The colloid reactions, if carried out under properly controlled conditions, are physico-chemical experiments which give information concerning the protein composition of C.S.F. The results are only indirectly applicable to the diagnosis of disease. WARREN M. SPERRY (Chem. Abstr.).

The Diagnosis of Poliomyelitis in Spinal Fluid. Donhardt, A. [*Z. ges. inn. Med.*, **3**, 300–7 (1948).]

In the early stage of poliomyelitis the cell count and sugar concentration were high and the protein concentration was low in lumbar fluid and cisternal liquor. Later, low cell counts and sugar concentrations and high protein concentrations were found, with no change in the albumin/globulin ratio. High protein concentrations in the early stage or high sugar values at the later stage were observed in cases ending fatally. Except in meningitis the Cl values were normal. The collargol-HCl reaction was more sensitive than the mastic reaction in indicating changes in the composition of the spinal liquor. B. LUSTIG (Chem. Abstr.).

The Ability of Organic Arsenic Compounds to Penetrate into the Cerebrospinal Fluid. Hüllstrung, H. [*Med. Klin.*, 1946, 131–3; *Chem. Zentr.*, 1947 (**1**), 141.]

Experiments reported show that even arseno compounds or their cleavage products are able to penetrate the hemato-encephalic barrier into the cerebrospinal fluid. *Spirotrypan* was used for the study. The biological method of Hawking (*cf. C. A.*, **31**, 2294^3), which makes use of the trypanocidal properties of the cerebrospinal fluid after the administration of As preparations, was used for the detection of the As. It is assumed that the substance actually detected by its trypanocidal effect is a cleavage product of arsenobenzene, probably the corresponding arsenoxide. M. G. MOORE (Chem. Abstr.).

Potassium Content of Normal Cerebrospinal Fluid. Helmsworth, James A., and Keefer, M. Lucille. [*J. Lab. Clin. Med.*, **32**, 1486–90 (1947).]

Samples of spinal fluid obtained by lumbar puncture from 64 normal persons were analyzed for K content by using a modified Lindo-Gladding procedure (Skinner, *et al., A.O.A.C. Methods of Analysis*, 4th ed., 1935, *C. A.*, **31**, 1944^5). The average K concentration was found to be 9·8 mgm. per cent. = a coefficient of variation of 11·2 per cent. P. L. HARRIS (Chem. Abstr.).

The Permeability of the Blood-Spinal Fluid Barrier for Sulfonamides in Some Mental Diseases. Buffa, Baldassarre. [*Rass. studi psichiat.*, **35**, 417–37 (1946).]

The concentrations of various sulfonamides during daily oral treatment were determined in the spinal fluid, blood and urine in 35 patients afflicted with various mental diseases. The concentration of pyridine compounds quickly attained a constant level in the blood and spinal fluid, probably because of slow renal elimination. The concentration of thiazoles in the blood was high, but not in the spinal fluid. In encephalitic Parkinsonism there was a reduced permeability in the blood-spinal fluid barrier; subjects with progressive paralysis showed higher concentrations in the spinal fluid than other patients. Other types of patients showed no significant differences. A. E. MEYER (Chem. Abstr.).

Sulfonamide Content of Blood and Cerebrospinal Fluid During Lumbar Drainage. Traina, S. [*Med. sper.-Arch. ital.*, **6**, 673–80 (1940).]

After administration of sulfapyridine compounds (8 gm. daily) for therapy of purulent leptomeningitis, the sulfonamide content of the blood and cerebrospinal fluid was, respectively, 6 and 5 mgm. per cent., and remained at that level during lumbar drainage for 3–4 hours. C. SCANDURA (Chem. Abstr.).

Electron-microscopic Studies of Globular Proteins in Cerebrospinal Fluid. Hellwig, C. A., Drake, R. L., Voth, H. W., and Bleicher, J. E. [*Am. J. Clin. Path.*, **18**, 852–6 (1948).]

Fifty cerebrospinal fluids were studied with the electron microscope. Spherical globulin particles measuring from 40 to 240μ in diameter could be seen. This would indicate that the proteins in spinal fluid are not dispersed in molecule solution, as

generally believed, but exist as molecule aggregates. The study of size and arrangement of protein particles in cerebrospinal fluid promises to be of value, not only from the clinical standpoint, but also in fundamental research in protein chemistry.
J. T. M. (Chem. Abstr.).

2. Pharmacology and Treatment.

The Effect of Quinine on the Nervous System. Cate, J. ten, and Boeles, J. Th. F. [*Arch. intern. pharmacodynamie*, **77**, 468–76 (1948).]

Pentothal and nembutal, also *d*-tubocurarine, lower the body temperature of rats. The two former drugs affect the electroencephalogram. Cooling does not affect cortical activity until the rectal temperature is below 32°. Doses of quinine from 10–15 mgm./100 gm. diminish the amplitude of the slow waves, and cause a reduction in the number of higher frequencies. This effect occurs at external temperatures of 20° and 30°. Quinine has a direct effect on the cells of the cerebral cortex and does not affect chronaxia. M. L. C. Bernheim (Chem. Abstr.).

Central and Peripheral Antagonism Between Curare and Prostigmine. Veis, R. A., and Karasik, V. M. [*J. Physiol. U.S.S.R.*, **33**, 229–34 (1947).]

Injection of prostigmine into mice lowers the mortality and diminishes the convulsions produced by the central action of curare. Curare prevents the fibrillary twitchings produced by the peripheral action of prostigmine.
B. A. (Chem. Abstr.).

Timed Intravenous Infusion of Metrazole and Strychnine for Testing Anticonvulsant Drugs. Orloff, Marshall J., Williams, Harry L., and Pfeiffer, Carl C. [*Proc. Soc. Exptl. Biol. Med.*, **70**, 254–7 (1949).]

An improved technique using mice is described.
L. E. Gilson (Chem. Abstr.).

Veratrinic Effects of Metrazole and DDT on Mammalian Neuromuscular Function. Eyzaguirre, C., and Lilienthal, J. L., jun. [*Proc. Soc. Exptl. Biol. Med.*, **70**, 272–5 (1949).]

Both compounds evoke a veratrinic response in nerve and muscle of rats under pentobarbital anesthesia. The characteristics of this response are indistinguishable from those of myotonia occurring spontaneously.
L. E. Gilson (Chem. Abstr.).

Effects of Frontal Lobotomy on Cerebral Blood Flow and Metabolism. Shenkin, Henry A., Woodford, Rachel B., Freyhan, F. A., and Kety, Seymour S. [*Proc. Assoc. Research Nervous Mental Disease*, **27**, 823–31 (1948).]

Cerebral blood flow, O consumption and repiratory quotient were significantly decreased below the pre-operative values 13 to 33 days after frontal lobotomy in 7 patients. Warren M. Sperry (Chem. Abstr.).

Post-hypoglycemic Encephalopathy in Sakel's Insulin Treatment. Spencer, A. M., [*J. Ment. Sci.*, **94**, 513–54 (1948).]

Review, including biochemical changes in blood, cerebrospinal fluid, urine, brain and other organs. Warren M. Sperry (Chem. Abstr.).

Some Neurological Aspects of Carbon Disulfide Poisoning. André, M. J. [*Bruxelles méd.*, **27**, 2398.2414 (1947); *Chimie et Industrie*, **59**, 254 (1948).]

A description and discussion of the symptoms.
A. Papineau-Couture (Chem. Abstr.).

Changes in Blood Chemistry in Rats Following Electrically Induced Seizures. Ward, John R., and Call, Lloyd S. [*Proc. Soc. Exptl. Biol. Med.*, **70**, 381–2 (1949).]

Severe respiratory and metabolic acidosis, accompanied by increases in plasma lactate, phosphate and Na, occur in rats after maximal electrically induced convulsions. These chemical changes may contribute to the observed depression following the seizures. L. E. Gilson (Chem. Abstr.).

Fibrinolysis Following Electrically Induced Convulsions. Fantl, P., and Simon, Shirley E. [*Australian J. Exptl. Biol. Med. Sci.*, **26**, 521–9 (1948).]

Convulsions induced in humans by a.c. were associated with slight hemo-concentration, moderate increase in plasma proteins, and transient fibrinolytic activity. Fibrinolytic activity affected fibrin only, breaking it down to polypeptides ; fibrinogen was not affected. This action is in contrast to that of trypsin, and is added evidence that plasma protease and trypsin are different.

JOHN P. CRISPELL (Chem. Abstr.).

Method for Direct Comparison of the Depressant Effect of the Barbiturates on the Respiration and Circulation. Wiedling, Sten. [*Nature*, **162**, 1003 (1948).]

Guinea-pigs are anesthetized with urethan. The dose required to produce cessation of respiration is ascertained by direct observation. When respiration ceases the dose and time are noted, the thorax is opened, and artificial respiration by a previously prepared connection between the trachea and a Starling pump is started. The cessation of cardiac activity is observed, the dose and time noted. The effects of amytal, evipal, narkotal and pentothal are compared.

W. H. STAHL (Chem. Abstr.).

Parpanit, A New Therapeutic Agent for Disturbances of the Extra-pyramidal Motor System. Domenjoz, R. [*Schweiz. med. Wochschr.*, **76**, 15 pp. (1946) (*Separate*).]

The spasmolytic, local anesthetic and curariform actions of this substance, the diethylaminoethanol ester of l-phenylcyclopentane-1-carboxylic acid, are compared with those of atropine and other alkamine esters of this acid. No clinical details are given, but it has some action.

JACOB SACKS (Chem. Abstr.).

Ethyl Methyl Alcohol Poisoning. Protective Role of Ethyl Alcohol. Dérobert, L., and Hadengue, A. [*Ann. méd. légale criminol., police sci., méd. sociale, et toxicol.*, **29**, 243–5 (1948).]

EtOH retards the appearance of acidosis due to MeOH ; it is not an antidote.

E. HIRSCHBERG (Chem. Abstr.).

Very Acute Poisoning by Seconal Sodium. Moureau, P., Quinet, L., and Heusghem, C. [*Ann. méd. légale criminol., police sci., méd. sociale, et toxicol.*, **28**, 149–50 (1948).]

Oral ingestion of 9·8 gm. Na seconal caused death of a woman in half an hour. General congestion of organs and marked pulmonary edema were noted. Organs were extracted with ether, the residue was acidified, the drug absorbed on C, extracted from it with ether, and the identity was established by precipitation with Millon's reagent, microcrystallization and the Parri reaction. The quantity present was established by 0·02 N NaOH titration. Forty per cent. of the drug was recovered from the organs, mainly the stomach and intestine.

ERICH HIRSCHBERG (Chem. Abstr.).

Antagonism of Curare by Congo Red and Related Compounds. Kensler, C. J. [*J. Pharmacol. Exptl. Therap.*, **95**, 28–44 (1949).]

The dyes Congo red (I), Chlorazol fast pink, Evans blue, and Bis J acid urea, but not methyl orange, prevented paralysis in frogs when d-tubicurarine chloride (II) was the curarizing agent, but not when β-erythroidine or dihydro-β-erythroidine salts were used. (I) prevents the inhibition by (II) of the response of frog rectus abdominis muscle to acetylcholine ; the inhibition by the erythrina alkaloids was not prevented. Incubation with (I) augmented the response of the muscle to acetylcholine. (I) is a moderately potent inhibitor of frog brain cholinesterase activity *in vitro*, but no inhibition was observed *in vivo*. Related compounds varied in their anticholinesterase activity without apparent correlation between this property and their anti-(II) activity. (I) and related compounds prevent the passage of (II), but not the erythrina alkaloids, through cellophane. Precipitate formation under certain conditions indicates that (I) and (II) form a complex which is soluble or insoluble, depending on the molecule ratio of (I) to (II). The action of the dyes is therefore probably on (II) rather than on a functional component of the myoneural junction. A series of 14 naphthylaminesulfonic and aminonaphtholsulfonic acids, including J acid, did not decrease the duration of paralysis by (II).

L. E. GILSON (Chem. Abstr.).

Anticonvulsant Drug Action and Temporal Summation of Epileptogenic Stimuli. Bárány, Ernst H. [*Arch. intern. pharmacodynamie*, **74**, 155–61 (1947) ; *cf. C. A.*, **41**, 2159*c*.]

In rabbits the electric convulsive threshold to a 0·75-second shock was increased by phenobarbital, phenylhydantoin, NaBr, chloralose and allylisopropylbarbituric acid. The capacity for temporal summation of two 0·5 sec. epileptogenic stimuli given over a period of 1·2 sec. was unaffected.

MARSHALL E. DEUTSCH (Chem. Abstr.).

Acute Phenobarbital Poisoning. Treatment with Picrotoxin. Sita-Lumsden, E. G. [*Lancet*, **256**, 217–20 (1949).]

Administration of 1,650 mgm. of picrotoxin effected the recovery of a man who had attempted suicide by ingestion of 7·5 gm. of phenobarbital and 9·7 gm. of aspirin. BARBARA R. MURRAY (Chem. Abstr.).

Soporific Narcosis in Animals. Barke, A. [*Berlin. u. Münch. tierarztl. Wochschr.*, 54–6 (1947) ; *Chem. Zentr.*, (**1**), 736 (1947).]

The use of eunarcon and evipan-sodium is discussed. Rapid injection of relatively small doses of these preparations produces practically instantaneous narcosis without side effects. It appears possible that considerable amounts of the injected preparation are in some way deposited or accumulated in an inactive condition in certain regions of the circulation, and that toward the end of narcosis this material becomes active and is the cause of the post-narcotic excitation which is always observed. Attempts to eliminate such excitation upon awaking by chemical detoxication (thyroxine) or by the use of centrally stimulating or sedative preparations have so far failed. M. G. MOORE (Chem. Abstr.).

Influence of Strychnine on the Conditioned Reflex Activity in Animals. Fadeeva, A. A. [*Fiziol. Zhur.* (*J. Physiol.*), **34**, 325–32 (1948).]

In dog experiments with conditioned reflexes (food and sound) of various types, it was shown that injection of strychnine produces results which depend on the dosage used. Small doses (0·01–0·08 mgm./kgm.) lead to a somewhat lowered reflex level ; medium doses (0·08–0·11 mgm./kgm.) increase the reflex activity (particularly the food reflexes) and cause some toxic symptoms, but do not cause the strychnine convulsions ; the high dosage (0·12–0·2 mgm./kgm.) sharply drops the reflex level, and at the toxic dose level there is a complete hindering of all food-induced reflexes. The animals exhibit variations in responses according to the " psychological type " of the animal used ; in excitable animals small doses of strychnine give enhanced reflex levels, and medium doses are sufficient to give the hindering action. The changes of the magnitude of the conditioned reflexes by strychnine are thus a result of the disturbance of the work of the cortex of the brain hemispheres by the drug. G. M. KOSOLAPOFF (Chem. Abstr.).

Pharmacological Action of Some Sympathicomimetic Amines in Relation to Their Chemical Structure. (1) *Action on the Nervous System of Segmented Worms. Kovalenkov, K. M.* [*Fiziol. Zhur. U.S.S.R.* (*J. Physiol.*), **34**, 397–406 (1948).]

According to the level of action on the leech (and its preparations) the drugs can be arranged in descending order as : Pervitin, phenamine, ephedrine, sympathol and adrenaline. These amines act tonotropically on the leech musculature, the most profound effects being caused by adrenaline and sympathol, which not only raise the tone, but also cause spontaneous contractions. These two drugs act as stimulants on the reflex segmentary apparatus, while ephedrine, phenamine and pervitin invariably have a depressive action, after a brief stimulation period. The nervous reflex apparatus of the leech, after isolation from the organism, in part, such as the removal of the end segments which carry the head and the tail suckers, is more sensitive to the drugs than is the intact animal ; this is well shown in experiments with ephedrine, phenamine and pervitin. Ephedrine, and, especially, phenamine and pervitin, have a pronounced stimulating effect on the " central " nervous system, while adrenaline and sympathol have no effect, as shown by application of the drugs to the extirpated frontal part of the worm. The results agree with Barger and Dale's (*C. A.*, **5**, 109) views on the relation of biological activity and chemical constitution. G. M. KOSOLAPOFF (Chem. Abstr.).

Mechanism of the Convulsant Action of Strychnine; Lack of Atropine Antagonism. Wescoe, W. Clarke, and Green, Ray E. [*J. Pharmacol. Exptl. Therap.*, **94**, 78–84 (1948).]

The electric manifestations (electroencephalogram and electrospinogram) of strychnine action on the neuraxis of the cat were studied. Atropine has no effect on these manifestations, although it is very effective against those caused by the powerful anticholinesterase, diisopropylfluorphosphate (DFP). It appears unlikely that strychnine action on the spinal cord is referable to its anticholinesterase properties. Neither strychnine nor DFP spinal convulsions are well sustained unless the neuraxis is intact. L. E. GILSON (Chem. Abstr.).

The Potentiating Effect of Antihistaminic Drugs on the Sedative Action of Barbiturates. Winter, Charles A. [*J. Pharmacol. Exptl. Therap.*, **94**, 7–11 (1948); *cf. C. A.*, **41**, 6627*i*.]

The antihistaminics, pyribenzamine, neoantergan, benadryl, and 10-(2-dimethylaminopropyl) phenothiazine (RP 3277) prolong the sleep-producing effects of evipal in mice. Comparable effects were obtained with benadryl plus pentobarbital in mice and benadryl plus evipal in guinea-pigs. These observations appear to correlate with the reported incidence of sedation as a side effect in patients receiving antihistaminic drugs. L. E. GILSON (Chem. Abstr.).

Interaction Between Curare and the Potassium Ion at the Motor End-plate. Holmes, P. E. B., Jenden, D. J., and Taylor, D. B. [*Nature*, **162**, 217 (1948); *cf. C. A.*, **41**, 3219*c*]

Interaction between curare and the K ion is an ion-exchange reaction in the region of the motor end-plate (ion-exchanger). Curare acting on normal muscle would decrease the K bound to the receptor which is available for exchange with acetylcholine. In this case K ions would antagonize curare by increasing the available bound K. THOMAS B. NIVEN (Chem. Abstr.).

The Production of Unilateral Epileptiform Convulsions from Otherwise Quiescent Foci by the Administration of Benzedrine. Blum, R. A., Blum, J. S. and Chow, K. L. [*Science*, **108**, 560–1 (1948).]

Administration of benzedrine to a monkey whose prefrontal cortex had been removed resulted in increased activity, muscular inco-ordination, and general violence, followed by prostration. Seizures were stopped by administration of nembutal, but returned within an hour. Examination of the brain did not indicate gross abnormality or hemorrhage. D. PERLMAN (Chem. Abstr.).

Nicotine and the Nervous System. Ottonello, Paolo. [*Rass. clin. sci.* (*Ist. biochem. ital.*), **24**, 240–3 (1948).]

Description and discussion of three cases of pathological effects of smoking on the nervous system. C. SCANDURA (Chem. Abstr.).

Effects of Thyroxine Administration and Thyroidectomy on Neuromuscular Excitability in Rats. Chauchard, B., Chauchard, P., and Mazoué, Henriette. [*Comp. rend. soc. biol.*, **142**, 612–13 (1948).]

Thyroxine decreased nerve chronaxia and increased muscle chronaxia; thyroidectomy produced the opposite effects. L. E. GILSON (Chem. Abstr.).

The Detection of Barbituric Acid Derivatives in Urine. A Rapid Qualitative Test. Merley, Robert W. [*Am. J. Clin. Path.*, **18**, 906–9 (1948).]

Acidify 100 c.c. of urine to pH 4·0 (nitrazine paper) with dilute H_2SO_4. Extract twice in a separatory funnel with 75 c.c. of absolute ether, and combine the extracts in a 250 c.c. Erlenmeyer flask. Add 2·0 gm. of activated charcoal and 5·0 gm. of anhydrated Na_2SO_4, shake a minute, let stand three minutes, filter into a separatory funnel and wash with 30 c.c. of ether. Evaporate the ether solution to 25 to 50 c.c. on a steam bath, transfer to a calibrated tube and evaporate to 2·0 c.c. Add 0·2 c.c. of 5 per cent. LiOH in MeOH. If more than 1 mgm. of barbituric acid is present a white precipitate will form. Add 0·2 per cent. cobaltous acetate in MeOH until any blue color reaches its maximum. The following barbiturates give a characteristic blue-violet color: Barbital, amytal, probarbital (ipral), neonal, ortal, thiopental (pentothal-Na), pentobarbital (nembutal), phenobarbital, phanodorn, hexobarbital (evipal), alurate, dial, seconal, sandoptal, nostal, pernoston and vinbarbital (delvinal). Pentothal-Na produced a rich green color. The test is rapid and convenient. JOHN T. MYERS (Chem. Abstr.).

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The following names are printed in SMALL CAPITALS: Authors of original articles and of books reviewed. Names of authorities referred to in the text are in ordinary type.

(R.) indicates a *Review*; the title of the book reviewed is followed by the author's name, thus: "Psycho-analysis and its Derivatives, by H. Crichton-Miller (R.)."

(E.) indicates the *Epitome* section; the title of the abstract is followed by the author's name, thus: "Age and human ability. Miles, W. R. (E.)."

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